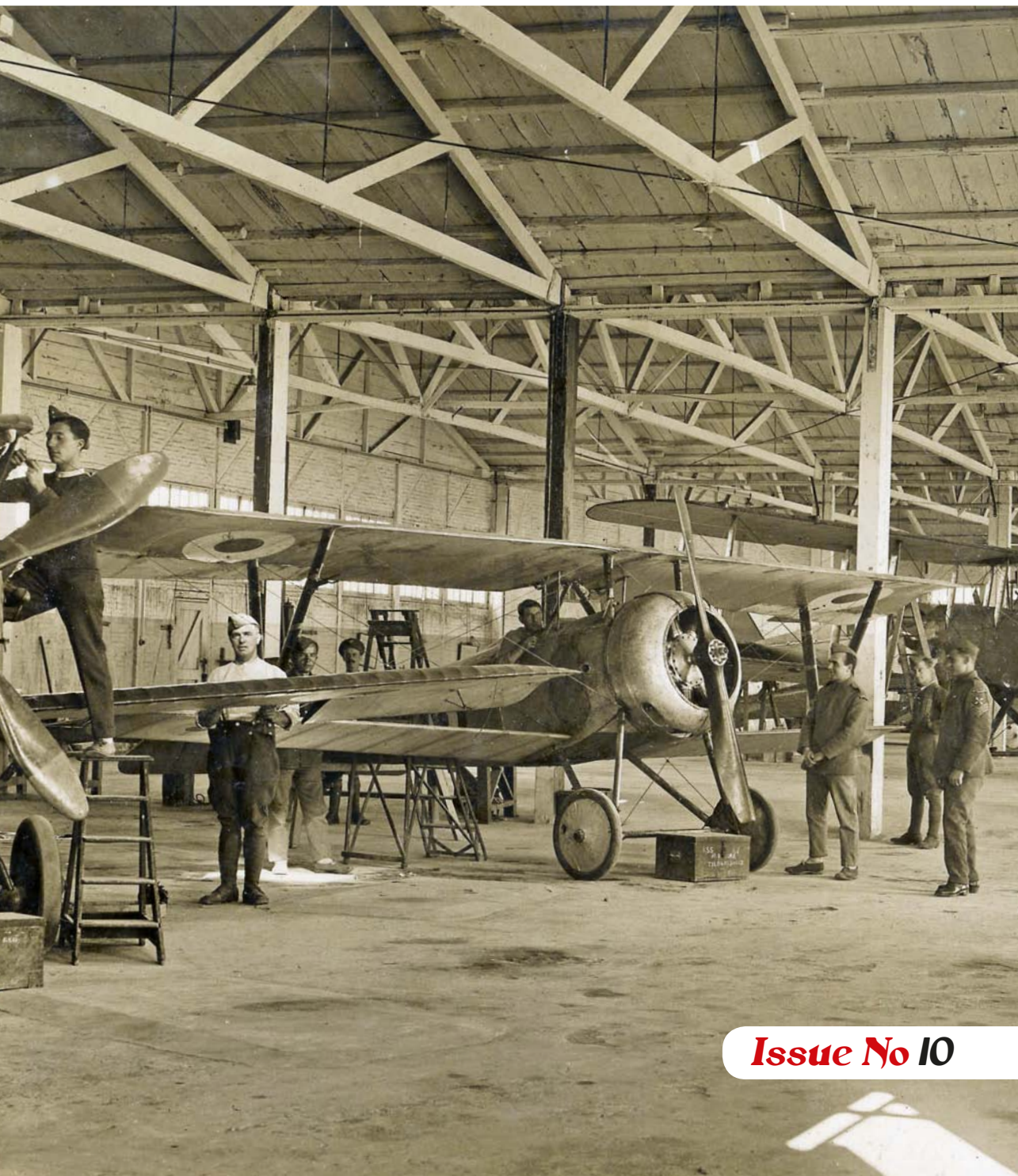


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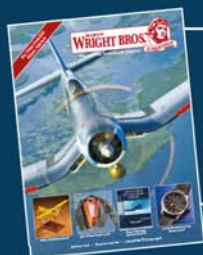
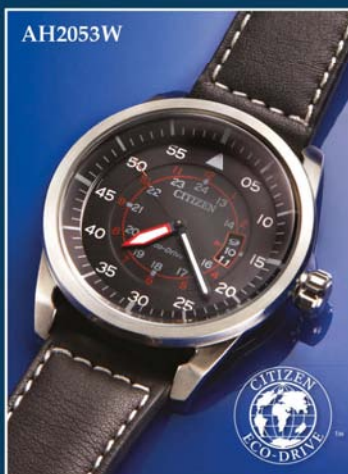


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Editor's Letter

A VERY HAPPY new year to all our readers, and a warm welcome to our tenth issue — double figures! — in which we've packed our bags for a truly international experience. Starting off in the Vale of Evesham, over which a frost-nibbled Cyril Uwins set a new altitude record in 1932, we then head for wartime Italy, where bitter political infighting prevented the development of a series of truly world-class homegrown fighters. After an in-depth stop in America to look at the equally politically fractious procurement of the US Marine Corps' AV-8A Harrier, we get low-down and dirty with the RF-51Ds of the 45th Tactical Reconnaissance Squadron in Korea, where the Mustang attrition rate was ferocious.

On we go to the Middle East — Philip Jarrett's World War One photographs of the RFC's X Depot in Aboukir are simply stunning, while Ray Flude's detailed account of the Allied 1942 airlifts to Cairo brings to light an oft-forgotten yet heroic effort on the part of British, Canadian and American air transport pilots — before alighting in pre-revolution Iran, where the country's first rotary-wing pilot recalls his not-always-pleasant experiences with the Cessna Skyhook helicopter, further to our history of the type in *TAH3*.

Finally, we wend our way back to our starting point in good old Blighty, with former Air Transport Auxiliary dynamo Joan Hughes being arrested for flying under a bridge on the M40 in a Tiger Moth disguised as one of International Rescue's Thunderbirds. It's quite a journey — *bon voyage!*

PERSONAL NOTE It is my sad duty to report that *TAH* Editorial Board member Harry Fraser-Mitchell died on October 28, 2014. We were privileged to have his advice, support and friendship. He will be much missed.

FRONT COVER A *Nieuport Scout* undergoes maintenance in Egypt during the Great War; more exquisite images on pages 64–71.

BACK COVER: An AV-8A Harrier pilot of US Marine Corps unit VMA-542 prepares for a mission. The story of the type begins on page 40.

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40



12



96



56



74



34



106

CONTENTS **Issue No 10**

3 EDITOR'S LETTER

6 AIR CORRESPONDENCE

12 ON HEAVEN'S DOORSTEP

Worcestershire-based author Tony Buttler investigates local reports of Cyril Uwins's record-setting flight to 44,000ft over Evesham in a Vickers Vespa in September 1932

20 HOW NOT TO CHOOSE A FIGHTER

Gregory Alegi provides fresh insight into Italy's disastrous wartime procurement of a series of promising fighters powered by Germany's state-of-the-art DB 605 engine

34 ECHOES FROM DAWN SKIES: BIRDS OF A FEATHER

Our serialisation of British pioneer F.W. Merriam's long-lost manuscript of memories from his contemporaries continues with recollections by Ronald Kemp, and of F.P. Raynham

40 SELL IT TO THE MARINES

Chris Farara opens our two-part section on the AV-8A Harrier with the story of the type's development up to its introduction into US Marine Corps service . . .

48 BIRD OF PREY

. . . at which point Lon Nordeen takes over to detail the invaluable jump-jet's career with the "Flying Leathernecks"

56 THE POLKA DOT RIDGE-RUNNERS

The RF-51D Mustang pilots of the USAF's 45th TRS arguably flew the most dangerous low-level missions of the entire Korean conflict, as Doug Gordon relates

64 "THERE WERE FINS, WINGS AND COUNTLESS OTHER THINGS . . ."

Philip Jarrett presents a selection of magnificent original photographs collected by mechanic George Wright in Egypt during World War One

72 AN EYE FOR DETAIL: GET CRUNGE!

Next up in Juanita Franz's series on lesser-known airframes and their markings is an RAAF Mirage III that, albeit temporarily, became the mount of "AVM Hannibal Crunge"

74 FOLLAND'S FORGOTTEN MONOPLANES Pt 2

The second of Ralph Pegram's three articles on the little-known Gloster monoplane designs of Henry Folland

84 "SOME SUPREME EFFORT . . ."

In June 1942 an Allied airlift of global proportions was mounted to resupply British forces in North Africa in the wake of the fall of Tobruk. Ray Flude tells the full epic story

96 THE SHAH'S SKYHOOKS

Further to our history of the Cessna CH-1 Skyhook in *TAH3*, Iranian aviation historian Babak Taghvaaee tracked down Iran's first helicopter pilot, Col Gholam-Reza Rahbaryan, to find out more about the type in Iranian Gendarmerie service

106 AGAINST ALL ODDS

David H. Stringer concludes his definitive two-part history of the USA's post-war non-scheduled airlines — or "non-skeds" — from the Korean conflict to deregulation

118 ARMCHAIR AVIATION

123 LOST & FOUND

124 ALIAS THUNDERBIRD 6

Pilot, airshow commentator and part-time air-traffic controller Melvyn Hiscock reveals the alter ego of Tiger Moth G-ANFM, and explains how Joan Hughes landed herself in trouble with the aircraft in 1967 — by failing to land

130 OFF THE BEATEN TRACK

AIR CORRESPONDENCE



Letters to the Editor

The ups and downs of VTOL

SIR — *TAH* Issue 9, as usual, contains excellent articles. Having been intimately involved in the early flight development of the Hawker P.1127 at Dunsfold, I was particularly interested to read Dr Andreas Zeitler's piece on the VJ101s, which brought back many memories.

In 1964 I was sent to Germany by Hawker Siddeley Aviation to participate in the flight testing of Dornier's Do 31 hover rig at Oberpfaffenhofen near Munich. The Chief Test Pilot was Drury Wood, an American, like George Bright, and he took me to Manching where I met George shortly after his crash in VJ101C X1. He was pretty well recovered but not flying. He told us that the crash was caused because the roll autostabiliser had been connected backwards so

that when he counteracted a small roll the autostab made it worse, but maybe later investigation found a gyro fault.

I asked George, while he was driving us in his massive and silent Ford Thunderbird, if the VJ101 trials had included off-runway operations, on grass for example, as we had done with the P.1127. He replied with a smile that this had not been attempted as the VJ101 was "a post-hole digger!"

It is true, as the author states, that Hawker had developed the rolling vertical take-off (RVTO) technique; however, this was not because the runway would be damaged by the Pegasus exhaust, but was to minimise hot exhaust gas ingestion by the engine intakes which reduced thrust by about 100lb for every 1°C rise in average intake temperature. We realised later

*A glorious winter photograph of the Dornier Do 31 experimental VTOL jet transport — **TAH** subscriber Chris Farara visited Oberpfaffenhofen for its hover rig trials in 1964, where he learned more about the EWR VJ101C, for which the Do 31 was designed to provide tactical support — see his letter on this page. TAH ARCHIVE*



that the RVTO technique also ensured that any debris thrown up from the runway (FOD in today's parlance) by the engine exhaust would remain behind the intakes and so not damage the engine fan.

Chris Farara Guildford, Surrey

How to spread cheer — thinly

SIR — Now that Christmas is behind us and credit-card bills are landing on our doormats, this aviation story might help *TAH* readers to entertain their festive guests next year without breaking the bank — because it explains how to serve drinks to 62 guests from only one bottle of spirits . . . that's right, 62 drinks from only one bottle (in this case, a bottle of brandy.)

When package holidays were introduced in the mid-1950s they were immediately very popular — the prices were reasonable and, for the first time, British holidaymakers could afford to go abroad. In the early 1960s, building on the success of the summer package holidays, some travel companies started to offer winter "ski packages".

These winter holidays offered flights to airports near ski resorts, accommodation in beautiful hotels in the mountains, meals, and skiing lessons. One company also said in its brochures: "Your winter holiday begins immediately after take-off, when you will be served a hot toddy . . . no waiting for 'après ski' time!"

We [British United Airways] used Viscounts, carrying 62 passengers, for these winter holidays. One day in January 1962 I went out to the aircraft before the passengers or crew boarded, and went through the usual pre-flight routine. Everywhere was clean, the correct number of meals were on board, and I looked in the loos (not only for cleanliness but also because we'd been told in our training, "If you are ever going to have a stowaway, he or she will probably hide in a lavatory"). Before going out to the aircraft, I had checked the duty-free bar with a Customs officer, after which it had been sealed, and it was now on board; the seal was not to be broken and the bar was not to be opened until we had crossed the English coast and were beyond what was referred to in those days as "the three-mile limit". Separately, three bottles of brandy were stowed in the galley to be used for the "immediately after take-off" hot toddies. These bottles were duty-paid, so were not part of the sealed bar.

The crew and the passengers boarded; I counted the number of passengers, confirmed that "the ship's papers" were on board, made my pre-flight announcement, and went to report to the captain. As I went to the cockpit, I walked through the galley. Just a few minutes earlier I'd



ABOVE "Hot toddy, Sir?" — this TWA Lockheed Super Constellation advert evokes the convivial effect for which stewardess Angela Waller was aiming — see her "How to spread cheer — thinly" story on this page. Note how the artist has added cabin headroom for enhanced marketing value. Angela is seen **BELOW**, smiling from the steps of British United Airways Vickers Viscount G-APTD at Entebbe in February 1961.



checked that the three bottles of duty-paid brandy were in the galley ready for use . . . but now there was only *one* bottle of brandy standing in the galley! I exploded! The radio officer, whose seat was close to the galley, looked around and asked, "What's the problem?" I pointed out angrily and rather vigorously that there had been *three* bottles of brandy in the galley . . . now there was only *one*! How the hell was I going to make 62 hot toddies? We were already taxiing out! The radio officer said "Hang on . . . once we've taken off, I'll tell you what to do". I took my seat, ready for take-off, fuming with anger.

As soon as we were airborne, the radio officer beckoned to me. "This is what you do: set out all the glasses, get very hot water as usual, put orange juice and sugar into each glass, then add the very hot water." (So, the usual hot toddy mix except there was no brandy in the mixture in the glass!) The radio officer went on, "Now, open the bottle, dip one finger into the brandy, and then run it round the rim of a glass; keep dipping your finger into the brandy and doing this to each glass."

I did what he suggested, and the glasses containing the "hot toddies" were put on trays and carried out into the cabin. As the trays were taken first to the seats at the rear of the cabin, the passengers in the rows in the front and the middle of the cabin could smell the brandy as the trays were carried through. Gradually we worked towards the front of the cabin, and not only had the passengers seated there smelled the brandy but now, as they took their glasses and sipped, they could, of course, taste the brandy around the rim of the glass.

Not one complaint. Lots of compliments, and "That's the way to start a holiday!"

So there you have it: 62 hot toddies out of *one* bottle of brandy!

Angela Waller Middleton-on-Sea, West Sussex

The best things . . .

SIR — Back in May 2014, when ordering from The Aviation Bookshop [see www.aviation-bookshop.com — Ed], I was encouraged to read one of your early issues, followed it up with a back-order from you and have now become hooked.

My main interest is historical military aircraft 1936 to 1968 (including preservation) but how you have broadened my horizons! The articles are extremely well written, are very interesting and so instructive. What quality.

Long may you continue, and my thanks and best wishes to all contributors.

Malcolm Graham (now a subscriber) Wirral

. . . come in small packages

SIR — This morning I saw Capt Pomanti [ref *Alitalia's Fab Four* in TAH9] at the Macchi Pilots' Club and gave him a copy of *TAH*, still in its original packaging. All those present send their congratulations for the excellent quality of the envelope, but also the neat postage and address label. Well done!

Gregory Alegi Rome, Italy

[We take it as read that Capt Pomanti enjoyed the contents as well as the packaging — Ed]

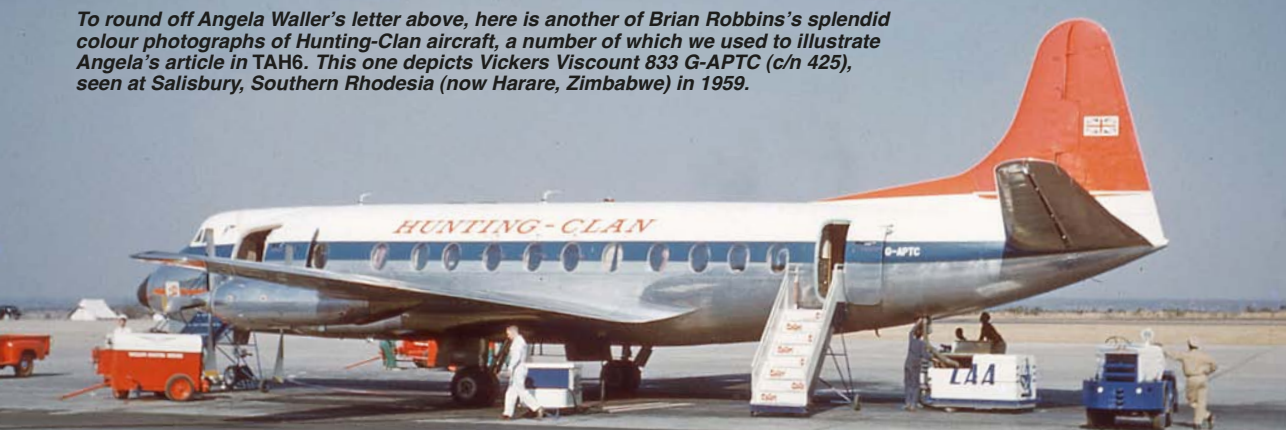
LDA and Super Ace

SIR — Once again, a fascinating issue of *The Aviation Historian* (TAH8).

I was deeply saddened to learn of the death of another old friend, David Lockspeiser. We had many discussions over the years regarding the progression of his Land Development Aircraft, particularly because it seemed at one time that it would fit in with Britten-Norman's own development plans, sadly ruled out by continued financial problems in the 1970s–80s. It didn't stop David's frequent visits to my then home in West London with sheaves of drawings and abundant ideas.

The LDA had one significant group of features that were perhaps overlooked in your description.

To round off Angela Waller's letter above, here is another of Brian Robbins's splendid colour photographs of Hunting-Clan aircraft, a number of which we used to illustrate Angela's article in TAH6. This one depicts Vickers Viscount 833 G-APTC (c/n 425), seen at Salisbury, Southern Rhodesia (now Harare, Zimbabwe) in 1959.



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First was the fact that the original undercarriage was four-wheeled to enable the aircraft to taxi over and straddle its cargo pannier, which could then be winched up from an internal four-point hydraulic winch. The second was the remarkable fact that, no doubt inspired by Oliver Simmonds in the 1930s, the wings and other components of the aircraft were interchangeable and a complete set of spare surfaces could be carried inside the fuselage. The unpredictable consequences of bush-flying work were thus insured against — an important selling point. The failure of the LDA must join with the Portsmouth Aerocar as being among light and commercial aviation's most egregious post-war lost opportunities.

Elsewhere Richard Riding recounts the story of the Chrislea Ace. Its design and construction were begun quite a while before the end of the 1939–45 war, suggesting that Richard Christoforides, already engaged in contract war work, had discovered a way of “finding” materials that were on strict permit allocation. However, the finished Ace had a huge advantage over Taylorcraft's Auster in that it had a wide cabin for four people with a fantastic all-round view. The problem was that this glasshouse completely blanketed the vertical tail surfaces and compromised elevator control at low speed. In short, there was no rudder and very little elevator for landing.

Rex Stedman's first take-off was therefore very impressive, for the little Ace set off in more or less a straight line and everybody watched it

disappear into the distance. Some 40 minutes later, when it managed to return and effect a sort of landing, Stedman related how he had had to turn by using little more than aileron drag, which explains why the Ace in a “tight” turn clocked more than ten miles' radius. No easy trick with an aircraft not fitted with conventional controls and no equivalent of “stick centre” datum.

Rex told me in later years that full rudder in either direction did nothing but raise or lower the nose, this being the logical result of a drag couple versus the propeller slipstream. This alerted him to the fact that he had no rudder (he thought it had fallen off until he looked round to see!). With a normal control-column, he could have jerked the aircraft round on aileron by repeatedly whamming the stick to one side and then central again, but you can't do this with a wheel, especially one that has no “neutral” position. It was a very frightened Stedman who landed after that maiden flight. As a result Leak designed a huge tailplane/elevator and twin fins/rudders. Interestingly, even this was not sufficient: three distinct sizes of vertical tail are discernible after the prototype.

Frankly I did not like flying the Super Ace: even in that later state it was an aeroplane that gave the impression of being worrying to fly in bad weather or cloud. Even the Auster seemed affable after ten minutes in 'AKFD.

Arthur W.J.G. Ord-Hume (former Designer, Britten-Norman Ltd, and Chief Designer, Phoenix Aircraft Ltd) Guildford, Surrey



New evidence emerges for that “Hawker Blue” paint



MIKE STROUD / TAH ARCHIVE

Following publication of our article on Hawker Hurricane PZ865's post-war racing career in TAH5, Chris Farara and Dick Poole alerted us to the fact that the late David Lockspeiser had built a 1/72nd-scale model of Hawker Tomtit G-AFTA (the full-size aircraft is seen ABOVE at Old Warden in 1960), and finished it in the very same paint used on all the Hawker “heritage” aeroplanes. TAH has borrowed the model, RIGHT, from David's family, to examine the colour — which is close to Methuen 20F8, and just a touch lighter than Humbrol 15 Gloss Midnight Blue.





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ON HEAVEN'S DOORSTEP

In the early 1930s Great Britain established itself as a world leader in aviation with the setting of a number of records for speed, range and altitude. It was the last of these that caught the imagination of Worcestershire-based author **TONY BUTTLER**, who takes a look at local reports of Cyril Uwins's remarkable flight to 44,000ft over Evesham in 1932

ACCUSTOMED AS WE are these days to space travel, supersonic flight and cruising across the Atlantic in comfort at 33,000ft, it is extraordinary to think that back in the 1930s none of these achievements was even close. However, despite the fact that most of the world's aircraft at that time were slow biplanes lumbering around at low altitudes, pioneering pilots and the aircraft industry in general were taking giant steps to push the capability of the still relatively new technology ever further.

Probably the most high-profile achievements in aviation at that time were the machines designed and built for the Schneider Trophy air races; high-performance seaplanes which were incrementally increasing the maximum level speed on a regular basis. In September 1931 Flt Lt George Stainforth broke the 400 m.p.h. (645km/h) barrier in the Supermarine S.6B. Just a year later Britain set another world record which was perhaps less visibly spectacular but just as significant, when Bristol test pilot Cyril Uwins set a new world altitude record, the first time Britain had managed to achieve this particular feat.

THE MAN FOR THE JOB

On Friday, September 16, 1932, Cyril Frank Uwins, chief test pilot for the Bristol Aeroplane Co, flew modified Vickers Vespa biplane G-ABIL, fitted with an example of Bristol's new nine-cylinder supercharged Pegasus radial piston

engine, to an altitude of 43,976ft (13,404m). This was more than 800ft (245m) higher than the previous figure set by Lt Apollo Soucek of the US Navy, who, on June 4, 1930, had reached 43,166ft (13,157m) in a Wright XF3W Apache.

The Vespa two-seat Army co-operation aircraft was an open-cockpit biplane designed originally to operate from airfields situated at up to 13,000ft (3,960m) above sea level. For this purpose it had been provided with wings of unusually large area that resulted in a very low wing loading. For his record attempt Uwins had to take every possible precaution to protect himself from the intense cold and rarefied air. He wore electrically heated goggles, gloves, boots and clothing, while the aircraft's oil tank had been reconfigured to help heat the cockpit. An oxygen supply into a face mask enabled him to breathe in reasonable comfort, while crouching down in the cockpit reduced his exposure to the freezing onslaught of sub-zero

air. Nevertheless, taking an aircraft to such heights without the albeit meagre protection of a canopy and without a pressurised cockpit would have been quite an ordeal for the pilot. Uwins explained that he had previously made a series of flights in which he progressively took the aircraft a little higher, gradually working his way towards the record.

The record flight itself was the outcome of efforts being made by Bristol to explore the supercharging of aircraft piston engines to permit





ALL IMAGES VIA PHILIP JARRETT COLLECTION

TOP Bristol test pilot Cyril Frank Uwins in 1936. Uwins transferred to the Royal Flying Corps from the London Irish Rifles in 1916 and served with Nos 13 and 64 Sqns before becoming a ferry pilot at Farnborough after breaking his neck. He was seconded to Bristol in 1918 and joined the company officially the following year.
MAIN PICTURE Uwins at the controls of record-setting Vickers Vespa G-ABIL above the Bristol Channel in 1932.



ABOVE The first Vespa built, originally registered G-EBLD, became the much-modified Vespa VI, re-registered as G-ABIL in January 1931. **BELOW** Following its sojourn in China, G-ABIL was modified again (note the filled-in upper wing centre section), fitted with a Pegasus engine with Townend ring and redesignated the Vespa VII.

them to work at higher altitudes; indeed, it was the culmination of a prolonged period of research into supercharging.

THE POWER BEHIND THE GLORY

The powerplant was a 900 h.p. Pegasus I.S.3, which replaced the Vespa's usual Bristol Jupiter engine, and used a special "BP Plus" spirit (fuel) and Aero-Shell lubricating oil. The Vespa's large 50ft (15m) wingspan provided low induced drag, which played an important part in achieving and maintaining climbing speeds, making the type particularly suited for trials at high altitude.

The Pegasus fitted to G-ABIL for the record flight was standard except that the diameter of the supercharger impeller had been increased by 1in (2.5cm) and the compression ratio had been raised slightly above the normal 5:3:1. Streamlining of the engine was achieved with

the fitting of a Boulton & Paul-built Townend ring, a narrow-chord cowling designed by Dr Hubert Townend of the National Physical Laboratory in 1929, which fitted around the cylinders of a radial engine in order to reduce drag and improve cooling of the engine.

In order to further reduce drag (or "head resistance" as it was described in local reports) G-ABIL was fitted with smaller undercarriage wheels. The jack pads, usually fitted to the axle-stubs of the mainwheels to accommodate the lifting jack used to raise the machine when working on the undercarriage, were also sawn off. In the cockpit (seen **OPPOSITE**) the spade-handle grip of the control column had a safety switch which the pilot had to keep in position in order to keep the engine running. The object was to ensure that, in the event of the pilot losing consciousness, his grip on the switch would







ABOVE The Vespa during one of the high-altitude flights made in September 1932. Uwins reported that on the earlier flights a degree of aileron control had been lost owing to differences in expansion and contraction of metal parts in the wing, but that other than that, the flights were "uneventful to the point of being boring".



LEFT The starboard side of the cockpit accommodated the Rotax control box for Uwins's heating equipment, with switches for goggles, clothing and oxygen.

relax, with the result that the engine would automatically cut out, eliminating the possibility of a full-power dive and giving the pilot time to regain consciousness and re-establish control. The device had successfully been called into play on a number of occasions.

The aircraft's front seat was faired over and Uwins flew the machine from the back seat. The front cockpit was fitted with fuel tanks, which were moved from their normal position in the wings, another step to help with streamlining. Having the fuel in the front seat also centralised the weight masses and improved the aircraft's balance, which made extended flights less fatiguing for the pilot. The front position was skinned over flush at this point, while the cutout in the centre section of the upper wing (through which the forward occupant would normally have to crawl to get aboard) was also filled in, adding several square feet of wing area and consequently reducing the wing loading still further.

UP, UP AND AWAY

Uwins took off from Bristol's Filton aerodrome at around 1300hr and alighted near Evesham in Worcestershire shortly after 1500hr. The September 23, 1932, issue of *Flight* magazine recorded that the weather was rather misty for the take-off, which must have meant that Uwins was probably out of sight of the ground

for the best part of two hours. Evesham is this writer's home town and it was the fact that the flight ended here that first alerted me to this remarkable record. A subsequent trip to Evesham Library to consult old issues of the *Evesham Journal* newspaper resulted in the discovery of a lengthy on-the-spot report which, apart from calling the aeroplane a "Vickers Vesta", was very informative.

Having chosen to use the Severn Valley district north of Bristol for the flight, Capt Uwins climbed in wide circles for nearly two hours, the wind continuing to carry him away from Filton. When he descended he was therefore unaware of his position and he landed in a field on a farm at Hinton-on-the-Green (about 2½ miles/4km south of Evesham), which belonged to Mr Harvey Stephens. Although it was stated in the press that Uwins had run out of petrol, the *Evesham Journal* report made it clear that he did indeed have enough fuel in the machine to make the return journey to Filton, but in view of the Vespa's small mainwheels he had decided not to attempt a take-off from the oatfield in which he had landed. With the smaller wheels Uwins foresaw the possibility of the aircraft sinking into the soft earth, causing the propeller to strike the ground. Consequently, he telephoned Bristol to ask for a larger pair of wheels to be brought over.

A party of Bristol mechanics and an official



ABOVE *On top of the world — the original Flight caption for this photograph of Uwins wearing his heated flying suit, goggles and oxygen mask in G-ABIL, states that it was taken “to give people an idea of what he looked like when he looked down on this vale of tears from 44,000ft”. He was in fact looking down on the Vale of Evesham.*

from the Royal Aero Club duly arrived at Hinton in quick time, the official removing the seals from the barograph to find that an altitude of approximately 45,000ft (13,710m) had been reached. At this height the Vespa's instruments had recorded 104°F of frost, and the rapid descent into the warmth of a September afternoon had caused Uwins a certain amount of physical distress. He was promptly taken to Greville Hall to recuperate, while during Friday afternoon and night the aircraft was left in the field guarded by a party of mechanics. Hundreds of people visited the site and, after he had returned on Saturday 17th, many of them saw Uwins take off in the Vespa after it had received its new standard wheels.

WHAT THE PAPERS SAID

The *Evesham Journal* report also reveals that Friday's successful attempt on the altitude record had been the fourth such effort made by Uwins. On Tuesday, September 13, he had almost achieved success when he reached a height which equalled the previous record, and so, without delay, preparations had commenced for the next attempt. On the Friday flight Uwins had taken the aircraft to its ceiling, the point at which the air was so rarefied that the aeroplane, with its controls still set for climbing, ceased to climb any further and “merely wallowed along in a horizontal direction”.

As noted, the record was confirmed using measurements made with barographs carried in the Vespa and which had been sealed for the flight. These were checked by the National Physical Laboratory at Teddington and the verified results were then submitted to the *Fédération Aéronautique Internationale* (FAI) for homologation. An altitude record had to be beaten by at least 100m (330ft) before it could be accepted by the international authorities, owing to possible errors in the calculation of the results given by the sealed barographs, which had to be placed in a spot that was inaccessible to the pilot. For Uwins's flight the barographs were positioned in a special compartment to which access was possible only by removing a panel from the underside of the fuselage almost immediately beneath the pilot's seat.

Uwins' flight had been observed officially on behalf of the Royal Aero Club of the United Kingdom by Capt Winters from Bristol Airport. The record was accepted by the Royal Aero Club during the following week and ratified by the FAI during October. It was reported that the record flight alone had cost the Bristol Aeroplane Company more than £5,000.

A week later a luncheon was given at Filton to commemorate the achievement, with Cyril Uwins as guest of honour. Vickers was represented by Mr Pearce who revealed that the Vespa selected for the flight had been built in

Uwins in the cockpit of G-ABIL in 1932. The "O-5" on the Vespa's fuselage is the marking it wore while operating under "B Conditions" (without a valid Certificate of Airworthiness). In May 1933 G-ABIL went to the RAF, with which it was given the serial K3588 and used for high-altitude and supercharger research.



1927 and had previously seen service in China, where it been marooned in water up to its wings for two months in Nanking before being brought back home to be reconditioned for the record attempt. This was given as an example of one of the new all-metal type aeroplanes scoring over the old wood-and-wire form of manufacture, which at Nanking would have deteriorated rather more during its long immersion in water.

The setting of the new altitude record by Uwins meant that Britain held both altitude and speed records at the same time, the Supermarine S.6B having taken the speed record to 407.5 m.p.h. (656km/h) in September 1931. In February 1933 Sqn Ldr O.R. Gayford and Flt Lt G.E. Nicholetts, flying a Fairey Special (aka Long-range Monoplane), added to Britain's glittering prizes by taking the non-stop distance record (distance flown in a straight line) when they flew 5,309 miles (8,544km) between Cranwell and Walvis Bay on the west coast of Africa.

For his achievement Uwins was awarded the Britannia Trophy, presented by the Royal Aero Club for aviators accomplishing the most meritorious performance in aviation over the previous 12 months. His record would stand for just over a year; on September 28, 1933, Frenchman Gustave Lemoine climbed to 44,819ft (13,661m) in a Potez 52A.



ACKNOWLEDGMENTS *The author would like to thank the staff of Evesham Library for their invaluable help with the preparation of this feature*

VICKERS VESPA DATA

Dimensions

Upper wing span	50ft 0in	(15.24m)
Upper wing chord	7ft 6in	(2.29m)
Lower wing span	44ft 0in	(13.41m)
Lower wing chord	5ft 6in	(1.68m)
Overall length	33ft 0in	(10.06m)
Overall height	10ft 6in	(3.2m)
Wing area	576ft ²	(53.5m ²)

Aerofoil

RAF 15

Loadings

Wing loading	7.6lb/ft ²	(37.8kg/m ²)
Power loading (at 9,000ft/2,745m)	8.25lb/h.p.	(3.7kg/h.p.)

Weights*

Empty	2,917lb	(1,323kg)
Fixed equipment	103lb	(47kg)
Load, fuel and oil	1,350lb	(613kg)
Maximum take-off	4,370lb	(1,983kg)

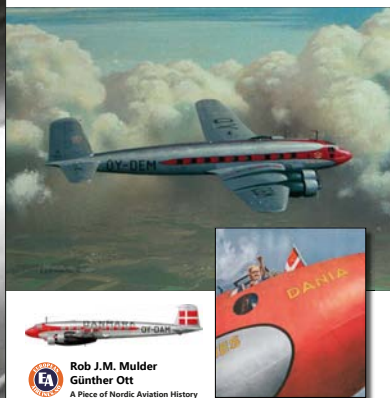
Performance*

Maximum speed		
at sea level	135 m.p.h.	(218km/h)
at 8,200ft/2,500m	155 m.p.h.	(250km/h)
Landing speed		
at sea level	50 m.p.h.	(80km/h)
Climb		
to 8,200ft/2,500m	6min	
to 16,400ft/5,000m	14min	
Ceiling	26,700ft	(8,140m)

* Standard Vespa Mk VI

Focke-Wulf Fw 200 Condor

With Danish Air Lines in War and Peace
1938-1946



Rob J.M. Mulder
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A Piece of Nordic Aviation History



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HOW **NOT** TO CHOOSE A FIGHTER

Italian aviation historian **GREGORY ALEGI** offers fresh insight into how political infighting and bitter industrial rivalry derailed the development of a series of potentially world-class Italian World War Two fighters, despite the availability of Germany's exceptional Daimler-Benz DB 605 powerplant



Italian style, German brawn — based on the proven Macchi MC.202 Folgore airframe, the MC.205V Veltro represented the easiest and quickest way to put a Daimler-Benz DB 605-powered fighter into series production. The Veltro was externally distinguishable from the Folgore by the twin cylindrical oil radiators under the nose. From the 101st production aircraft, 20mm wing cannon were fitted, as seen here.



THE “SERIE 5” SAGA: ITALY’S WARTIME FIGHTER-PROCUREMENT CRISIS

IN 1943 THREE Italian fighters powered by the German 1,475 h.p. Daimler-Benz DB 605 liquid-cooled V12 piston engine made their operational debuts. The Macchi MC.205V, Fiat G.55 and Reggiane Re.2005 were all powerful and elegant, and their relative merits are still debated today. What is less well-known, however, is that this new generation of state-of-the-art fighters was three years late owing to a tortuous decision process that pitted the nation’s industrial and political interests, as well as the machines’ technology and performance, against each other in a vicious struggle. The resulting domestic infighting would ultimately crown a foreign winner — the Messerschmitt Bf 109.

Between April and July 1943 the *Regia Aeronautica* (Italian Air Force) put the Fiat G.55 Centauro, Macchi MC.205V Veltro and Reggiane Re.2005 Sagittario fighters into service in rapid succession. With their high performance, the three new types promised to rejuvenate a front line that was still largely the same as that with which Italy had entered the war three years earlier, which included SIAI-Marchetti S.79 torpedo bombers, S.75 and S.82 transports and the Macchi MC.200 and Fiat G.50 and CR.42 fighters.

Even now, more than 70 years later, the three designs still fire the imaginations of enthusiasts and pilots alike — discussions about their handling, construction and performance frequently leading to heated debate, often based on local or

company allegiances, and always handicapped by looking at them separately. To obtain better insight into these so-called “Serie 5” fighters, it is necessary to look at the common procurement process through which they all came about.

(Incidentally, the “Serie 5” label is as apocryphal as it is widespread. It was coined in the 1970s by a journalist inspired by the USA’s “Century Series” nickname; in Italian wartime usage a “serie” was a production batch, indicated by Roman numerals.)

AN INDUSTRY OF PROTOTYPES?

This enthusiasm for the Italian DB 605-powered types is understandable. While few countries managed to introduce all-new designs into widespread service after entering the war, Italy claims the dubious prize for the longest aircraft-development times; furthermore, none of its third-generation designs became operational on any significant scale. With the notable exception of the MC.202, which Macchi chief designer Dr Ing Mario Castoldi had derived from his radial-engined MC.200 by installing the inline DB 601, evolution was minimal and production aircraft differed little from their prototypes. For example, during the production of the last batch of S.79s, the Alfa Romeo engines were optimised for low altitude and the useless bombardier’s gondola was removed (a field modification pioneered in 1942 by the 132nd Gruppo and only later adopted by SIAI), but the limited manufacture of Italian-



ABOVE Dr Ing Mario Castoldi, the father of the Macchi Schneider Trophy racers and “MC” series of fighters, beside the MC.202 prototype at Lonate Pozzolo. The MC.202 and MC.205V shared the vast majority of components, an important factor which would have meant an easy and swift switch to MC.205 production using the same jigs.

built DB 601 engines kept the obsolete MC.200 in production. And yet, there had been no lack of design competitions and prototypes, to the point where the widely-accepted summary of the Regia Aeronautica predicament is of a war fought with too many prototypes.

Enthusiasm for this trio of attractive World War Two fighters tends to obscure the fact that all three saw only limited production and negligible operational use before the Italian armistice of September 1943. Including the post-armistice period, their total wartime production did not go beyond 392 aircraft — 259 MC.205s; 101 G.55s and just 32 Re.2005s — far from the grandiose intended production plans and in stark contrast to the German supply of about 320 Messerschmitt Bf 109s (from a total production of more than 23,000 during this period alone) to the Regia Aeronautica during 1943–45. These figures shift the discussion from theoretical aircraft performance to the actual military, political and industrial situations usually overlooked in narratives based more on corporate lore than historical analysis. Some of the broader reasons for the Italian fighter fiasco lie in the structure of the nation’s industry and the delay of the *Ministero dell’Aeronautica* (Ministry of Aeronautics) in understanding the scope of the war that Italy had joined.

To grasp how these factors translated into

practice, it is instructive to look at Italian wartime fighter procurement, and specifically what the Regia Aeronautica had planned to do and what, instead, actually happened. The tortuous development story of the G.55 may be taken as a symbol of the byzantine procedures, poor management and subterranean manoeuvres in the corridors of power which conspired to keep the fighter branch in a constant state of inferiority. Similar stories could be written about the bomber branch (after four years of development the Cant Z.1018 delivered results comparable to the Cant Z.1007ter, simply a re-engined Z.1007bis), trainers and many other branches whose hopes were pinned on chimeræ which never materialised.

THE FIGHTER CRISIS

In 1935 the Italian fighter force comprised the equivalent of 11 *gruppi*, each made up of three *squadriglie* (squadrons) of 12 aircraft each. Six of these were equipped with Fiat CR.30 and CR.32 biplanes (powered by a 600 h.p. Fiat A.30 V12 engine), designed by Dr Ing Celestino Rosatelli, three were equipped with his earlier CR.20/20bis biplane (410 h.p. Fiat A.20 V12 inline engine), one operated Ansaldo AC.3 parasol monoplanes (a licence-built Dewoitine D.9 derivative powered by a 420 h.p. Bristol Jupiter radial) and one was equipped with Macchi M.41

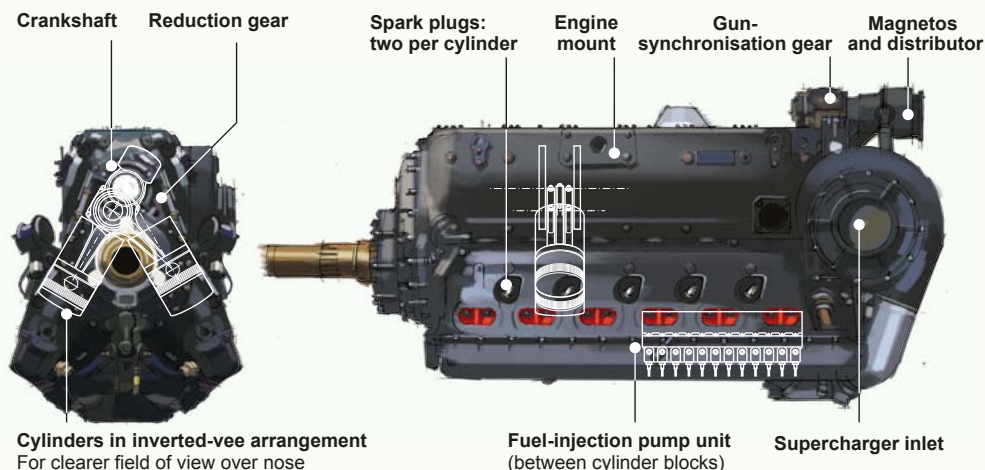
EVOLUTION, NOT REVOLUTION: THE DAIMLER-BENZ DB 605

THE DB 605 WAS the final evolution of Daimler-Benz's DB 600 of 1934. The key features of this inverted-V12 engine family included a shaft-mounted 20mm cannon, a Bosch direct-injection fuel system and a single-stage centrifugal compressor. The hydraulic control unit automatically adjusted the compressor settings in relation to air pressure, engine revolutions and fuel mixture; the Bosch unit then adjusted automatically based on the pressure and temperature of the air supplied by the compressor. This simplified engine handling, ensured smooth operation in any flight attitude and precluded the risk of backfiring.

The first engine in this family used by Italy was the DB 601Aa, a 33-629lit, 1,050 h.p. (1,175 h.p. emergency rating) at 2,400 r.p.m., 670kg (1,475lb) variant. The Regia Aeronautica obtained a licence to build the engine in 1939 and entrusted production to Alfa Romeo at its purpose-built Pomigliano d'Arco factory near Naples. Initially designated the Alfa 150 RC.41, the licence-built DB 601 later became the RA.1000 RC.41; "RA" indicated the Regia Aeronautica, "1000" the power category, "RC" the use of reduction gear and compressor, "41" the 4,100m (13,450ft) normal operating altitude of the powerplant and the "I" signified fuel-injection.

By increasing the bore from 150mm to 154mm, and the revolutions by 400 r.p.m. to 2,800 r.p.m., the DB 605 delivered up to 25 per cent more power (1,475 h.p. emergency, 1,250 h.p. continuous) than the DB 601, without changing the latter's external dimensions; remarkably, the new engine's dry weight increased by only 30kg (65lb). This allowed the DB 605 to use the same forged engine-bearers as for the DB 601 and fit the same basic airframe, allowing for risk-free aircraft evolution, which explains why Mario Castoldi derived his MC.205V seamlessly from the MC.202, much as Messerschmitt did with the Bf 109F and G models. The Regia Aeronautica selected the DB.605A variant and ordered it from Fiat as the RA.1050 RC.581.

A more powerful development, the DB 603, was capable of 1,510 h.p. maximum continuous power, but with 44-52lit displacement, 162mm bore, 180mm stroke and weighing significantly more than the DB 605 at 920kg (2,030lb), it was too large to be used on most existing airframes. The Germans found Fiat's G.55 attractive mainly on account of its ability to take the DB 603, rather than the aircraft's performance. **GA**



GRAPHIC: IAN BOTT / WWW.IANBOTTILLUSTRATION.CO.UK

flying-boats powered by a single 420 h.p. Fiat A.20.

Although the nimble CR.32 would do well in the Spanish Civil War the following year, the *Stato Maggiore Aeronautica* (Air Staff) was well aware that the fighter branch was on the verge of obsolescence. Like other air forces, the Air Staff foresaw a front line comprising twin-engined multi-crew long-range heavy fighters (*caccia combattimento*, which spawned the unsuccessful Breda Ba.88) alongside cheaper single-engined single-seat interceptors with high climbing speed but limited endurance.

Italy's first attempt at modernisation was made in 1935, with a design competition for interceptors soon cancelled when it was realised that "no [proposed] design answered all the requirements". This was the first sign that the

Rosatelli line was drying up; a worrying trend, as the Ministry had selected Fiat as its leading fighter supplier a decade earlier. Specifications for a new competition were issued in January 1936, usually referred to as the "1938 competition" because of the year in which the comparative flight trials were held.

Fiat immediately proposed the all-metal G.50 monoplane, designed by Dr Ing Giuseppe Gabrielli and powered by the 840 h.p. Fiat A.74 RC.38 radial. In December 1936 *Generale di squadra aerea* (Air Chief Marshal — Gen.s.a.) Giuseppe Valle, the Undersecretary for Air and Chief of the Air Staff, selected the G.50 to equip a complete *Stormo* (Wing), and 81 had already been ordered when the prototype flew on February 26, 1937.

The Macchi MC.200 first flew in December 1937,



ABOVE Designed by Dr Ing Giuseppe Gabrielli (INSET BELOW), the all-metal monoplane Fiat G.50 single-seat fighter was only a limited improvement on the same company's similarly-powered CR.42 biplane, which was popular with its pilots on account of its superb manoeuvrability, and of which nearly twice as many were built.

but when flown comparatively against the G.50 at the Guidonia test centre it proved faster and more manoeuvrable. This astonishing result — Fiat had won 61.16 per cent, by value, of all Italian fighter orders between June 1935 and September 1937; Macchi had been awarded nothing — forced the Ministry to order the MC.200, of which 1,176 examples would eventually be built, as against 791 G.50s.

While both were adequate machines for their time, the result was undermined by Fiat's decision to offer the A.74-powered CR.42 biplane, designed by Rosatelli and first flown in May 1938. The company somehow prevailed upon the Regia Aeronautica to adopt it as a transition type between the old CR.32 and the new monoplanes. While it is true that other countries were still operating biplane fighters — the US Navy had introduced the Grumman F3F in 1936 and the Soviet Union's Polikarpov I-153 entered service in 1938 — the "transitional" CR.42 would still be in production in September 1943, its manufacture having stretched from the 200 initially envisaged to 1,492 (plus 182 exports).

A third interceptor competition was announced on January 5, 1938, again with mediocre results. Of the seven designs submitted, the only one to enter production was the Reggiane Re.2000, the prototype of which had been built at the company's own expense and risk and which was eventually built mainly for export; 330 aircraft for Hungary and Sweden and a mere 15 for Italy. The



Macchi MC.201 and Fiat G.52, developed from the MC.200 and G.50 respectively, were both beset by problems with their designated 1,000 h.p. Fiat A.76 RC.38 radial engine, and neither ever flew.

In March 1940 the Regia Aeronautica thus asked Macchi to adapt an MC.201 airframe to accept the 1,175 h.p. DB 601A engine then entering production at Alfa Romeo in Naples as the RA.1000 RC.41I. Although the "adaptation"

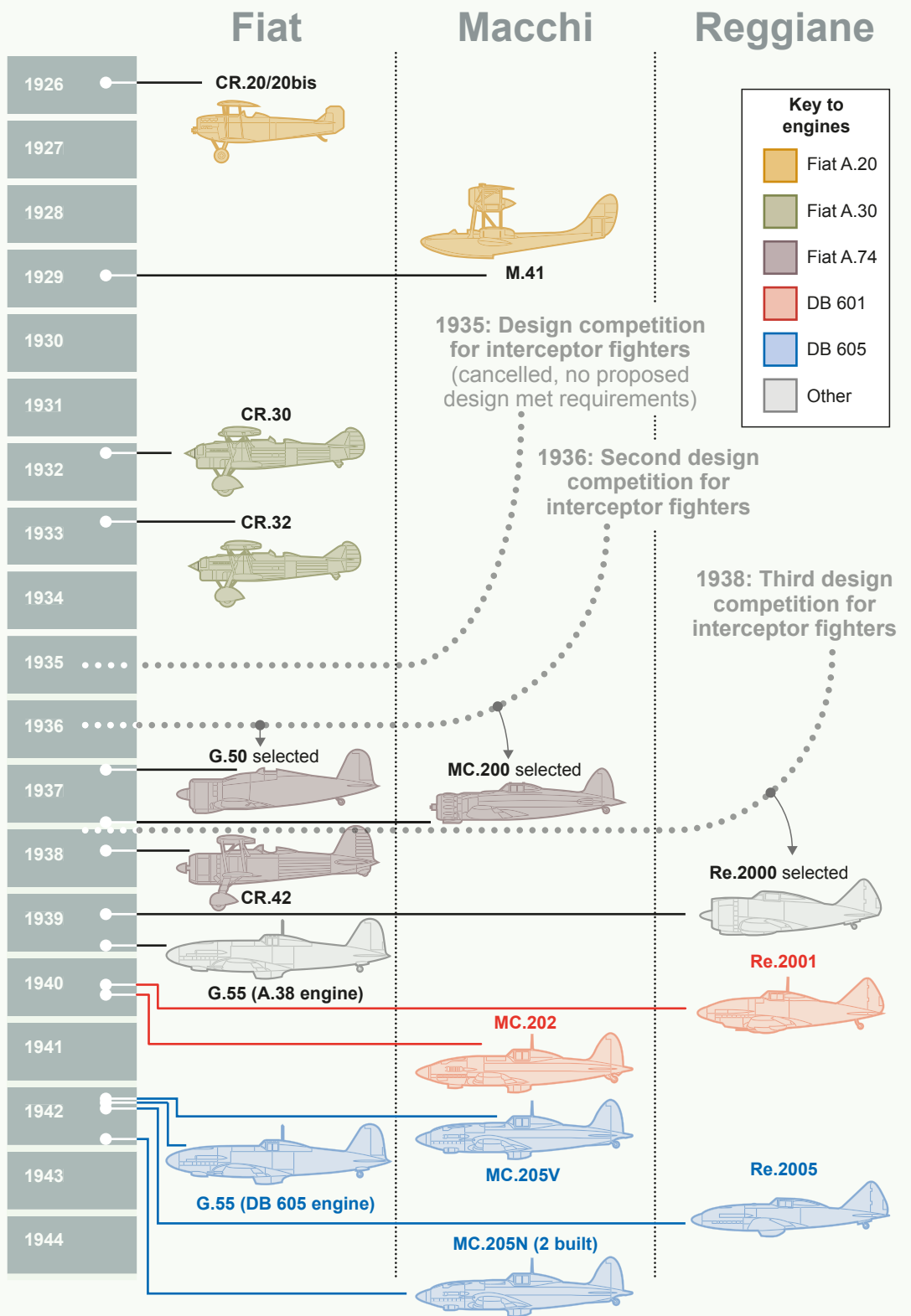
was purely administrative — amending the contract rather than cutting metal — this would lead to the celebrated MC.202 Folgore (Lightning), of which some 1,128 were ultimately built. The Regia Aeronautica also learned that Fiat had never actually commenced work on the G.52, turning instead in mid-1939 to a new type, the G.55, which was to be powered by the equally new A.38, a 1,200 h.p. V16 inline engine driving contra-rotating propellers, a powerplant derived from the similarly configured AS.8 created for the proposed CMASA CS.15 racer.

Also in March 1940, the Regia Aeronautica ordered three experimental and 12 production A.38 engines, intended for the G.55 and twin-engined Macchi MC.301 prototypes. Meanwhile, Reggiane set to work on adapting the Re.2000 to take the DB 601, thus creating the Re.2001, which made its first flight in June 1940.

Hence the stage was set for the tragedy that would be played out over the next five years. When Gen. s.a. Francesco Pricolo succeeded Valle on November 10, 1939, he immediately took

Italian fighter timeline

Graphic: Ian Bott www.ianbottillustration.co.uk





PHILIP JARRETT COLLECTION

ABOVE Regarded as the finest of Italy's World War Two fighters to see service in any numbers, the DB 601-powered Macchi MC.202 Folgore was fast and agile. **RIGHT** Gen s.a. Francesco Pricolo, Chief of the Air Staff during 1939-41, surveys the cockpit of the "motorjet"-powered Capini-Caproni C.C.2, as covered in detail by the author in TAH6.

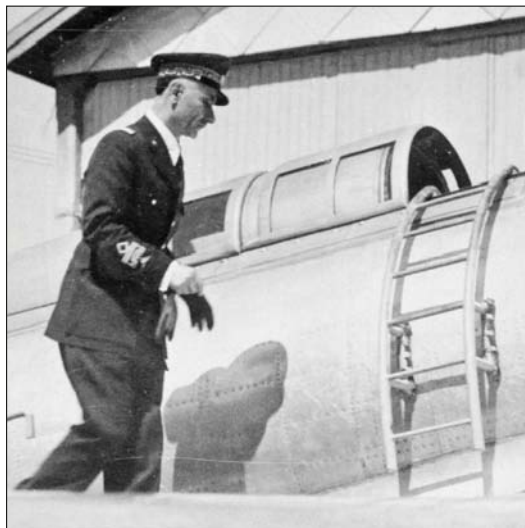
stock of the situation he had inherited in terms of current strength and future programmes. Among his first actions was a review of all types on hand, followed by an order to withdraw hundreds of obsolete aircraft from use.

THE "SERIE 5" IS BORN

While Macchi made the maiden flight of the MC.202 on August 10, 1940, Fiat proved unable to resolve its problems with the A.38, which had made its first test bench run in June 1940. The engine underwent radical changes: its configuration went from straight to inverted; the compressor was moved from the rear to the underside and the propeller became a conventional single three-bladed unit. Similar uncertainties also prevailed regarding the airframe. The original 22m² (237ft²) wing with a single tubular spar was abandoned for a conventional two-spar 21m² (226ft²) wing, initially proposed as a one-piece structure but in the event produced as port and starboard wings which were joined at the fuselage.

In March 1941, more than three years into the programme, Fiat suggested that a G.55 prototype might be ready for early 1942, with series production rather optimistically following towards the end of the year. On March 31 that year, Pricolo informed a meeting of three-star generals that the Regia Aeronautica could not "in any way rely upon series production, because it is far from being realised".

At a generals' meeting on June 25, 1941, Pricolo explained that Fiat had told him that the A.38 would have to be "significantly modified" before



AUTHOR'S COLLECTION

it could be put to any practical use, and enquired about the possibility of equipping the Re.2001 and MC.202 (but not, it should be noted, the G.50) with the 1,475 h.p. DB 605, which Fiat would be commencing the manufacture of in the spring of 1942 as the RA.1050. The Director-General of Constructions and Procurement, *Tenente Generale* (Lt-Gen) Alfredo Bruno, replied that, despite a weight increase of 100kg (220lb), it would be possible to build both an "adapted" Re.2001 and an MC.202 with "increased wing", giving a first glimpse of what would later become the Re.2005 and MC.205N Orione respectively.

During the summer of 1941 Macchi worked up a study of the MC.202bis, a Folgore with the bare minimum of modifications required to fit the DB 605, and in late October informed the Ministry of the performance expected of the new variant. Reggiane undertook a similar exercise and in October 1941 began building a wooden mock-up

In contrast to the MC.205, the Fiat G.55 was a clean-sheet design, which made it better suited to further evolution (including the fitting of the more powerful DB 603 engine as the G.56), but also meant longer development and tooling times. This is the prototype G.55, which made its first flight on April 30, 1942.



of the new Re.2005, which was followed by a preliminary report on November 25.

In a meeting on October 13, the generals were forced to acknowledge that the situation was beginning to get out of hand. From one perspective it appeared desirable to concentrate the limited Italian production of the DB 605 on a single fighter — either the G.55 or the MC.205N (and compensating Reggiane with an order for the Re.2002, a Piaggio P.XIX-powered Re.2000) — while another equally valid perspective suggested that the shortest lead time was highly desirable. In addition, some parties wished to optimise Fiat's workload, improve aircraft performance and increase industrial output by ordering airframe and engine from the same company, a position firmly espoused by Deputy Chief of Staff Gen. s.a. Giuseppe Santoro. Because Fiat had already been tasked with building the DB 605, this implicitly meant choosing the G.55, a

position Santoro stuck to in his semi-official 1957 history of the wartime Italian Air Force.

Uncertain as to what to do, the generals leapt at a compromise suggested by Bruno; namely building two examples of the experimental MC.202bis "for the purpose of helping and speeding the preparation of the definitive MC.205". Regarding Fiat, "taking note of the requirements of the Fiat production line in the fighter area", it was decided that Fiat could "build the DB 605-powered G.55, subject to positive testing of the prototype, or else it [would] build the MC.205."

Mussolini dismissed Pricolo on November 15, 1941, largely because of the latter's poor relationship with the *Capo di Stato Maggiore Generale* (Chief of the [Joint] General Staff), *Generale d'Armata* (Gen) Ugo Cavallero. In his bitter memoirs, Pricolo would claim that he had left the Regia Aeronautica with the MC.205 flying;

The second Reggiane Re.2005 prototype, with its elegant elliptical wingplan and distinctive outward-retracting undercarriage. The DB 605-powered Re.2005 bore only a passing resemblance to the company's previous fighter designs. Its early service with the 22nd Gruppo in the defence of Naples brought to light problems with flutter in the rear fuselage. PHILIP JARRETT COLLECTION





PHILIP JARRETT COLLECTION

ABOVE *The same graceful family lines disguise the fact that the Macchi MC.205N Orione was in reality an all-new design, with little in common with the existing MC.202; the Orione had a larger wing and an improved fuselage. Neither of the MC.205N sub-variants, the N-1 and N-2 (with wing-mounted cannon), would be put into production.*

this is an exaggeration, although there can be no doubt that it was on his initiative that the G.55 stalemate was broken.

On November 24, 1941, Pricolo's successor, Gen. s.a. Rino Corso Fougier, a World War One ace and popular fighter wing commander, reconvened the generals' board to re-examine the decisions made in October. The meeting marked the first occasion in which the former MC.202bis was referred to as the "MC.205V", with Gen. s.a. Mario Bernasconi describing it as an "aircraft which will be derived directly from the MC.202, replacing the DB 601 with the 605 and without making changes to the airframe. It may be expected that this aircraft will have a higher speed than that currently offered by the MC.202. The Macchi company has already begun the study and its construction will allow a more rapid development of the prototype of the MC.205 (DB 605)".

FIRST FLIGHTS

Informed that the MC.205V prototype, albeit armed only with machine-guns, would be ready during April–May 1942 (as against June 1942 for the G.55 and August 1942 for the MC.205N with increased wing area and 20mm cannon in the nose), Fougier found this "most interesting". While heavier armament would have been desirable, he noted, the early availability of the MC.205V prototype and the possibility of immediate series production were something to "keep well in mind". Fougier decided therefore to order 100 MC.205Vs from Macchi and 300 from Fiat which, still unable to create a worthwhile fighter, now faced a production crisis. Reinforcing the impression that this would be a temporary decision, Fougier ordered Fiat to tool up for both

THE "SERIE 5" COMPETITION

	1st	2nd	3rd
Performance	MC.205	G.55	Re.2005
Handling	MC.205	G.55 & Re.2005	
Combat aptitude	MC.205	G.55 & Re.2005	
Armament	—	All equivalent	—
Equipment	MC.205	G.55 & Re.2005	
Strength & structure	MC.205 & G.55	Re.2005	
Ease of construction	G.55 (100)*	Re.2005 (108)	MC.205 (113)

* The board took the G.55 as the baseline (100 per cent) and measured the other types against it. In other words, the Re.2005 was deemed 8 per cent and the MC.205 13 per cent more complex.

G.55 and MC.205V production, and on December 2 Bruno invited Macchi to "proceed with alacrity" with construction of the MC.202bis. The first joint Macchi-Fiat meeting for planned MC.205V production in Turin was held on January 8, 1942.

On January 15, 1942, the generals considered placing "further orders of MC.202 [and] MC.205V aircraft" until trials could provide the basis for a choice between the G.55, Re.2005 and MC.205N. The three new fighters would make their first flights on April 30, May 9 and November 1, 1942, respectively, all preceded by the MC.205V on

The “Serie 5” fighters compared

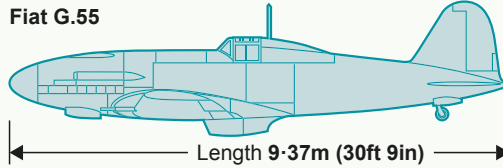
From the data below it may be seen that, while each of the “Serie 5” fighters was a promising design, it was a wasteful error to spread development across three very similar machines. Data for Fiat CR.42 and Spitfire IX is shown for comparative purposes

Wartime production

101



Fiat G.55



Armament

Key ● Machine-gun
● Cannon

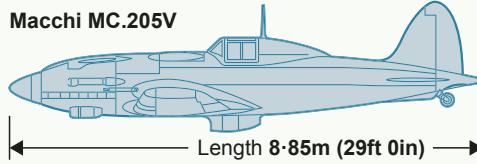
SAFAT
12.7mm
(x2)

Mausers
20mm
(x3)

259



Macchi MC.205V



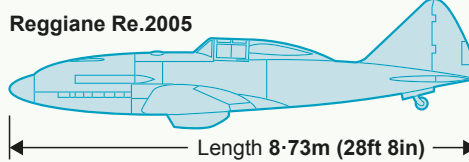
SAFAT
12.7mm
(x2)

Mausers
20mm (x2)

32



Reggiane Re.2005

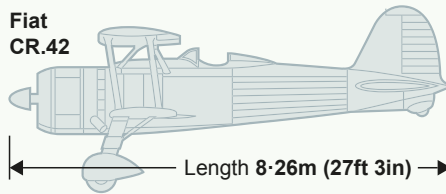


SAFAT
12.7mm
(x2)

Mausers
20mm (x3)

1,674

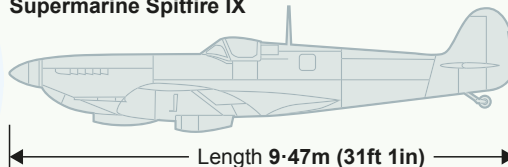
Fiat
CR.42



SAFAT
12.7mm
(x2)

5,675

Supermarine Spitfire IX

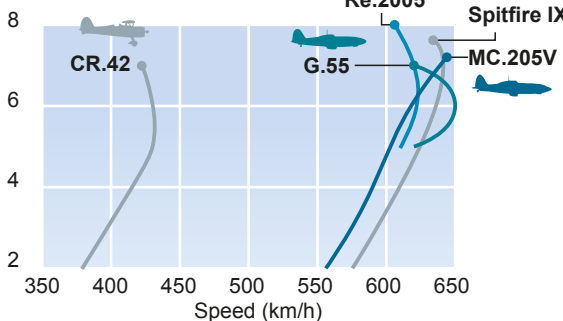


Browning 0.5in
(12.7mm)
(x2)

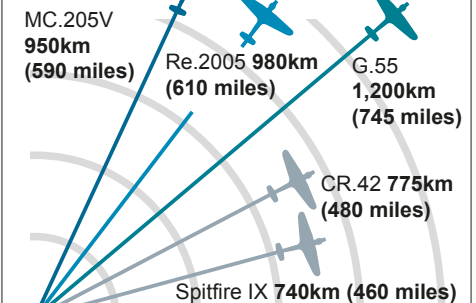
Hispano
20mm (x2)

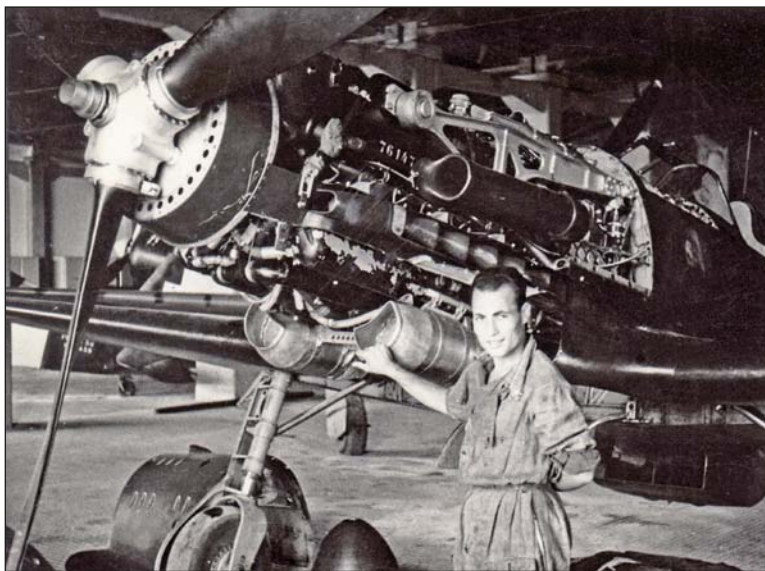
Speed

Altitude (000m)



Range





LEFT The MC.205V prototype at the Guidonia test centre, near Rome, during the brief evaluation trials. While the Re.2005 and G.55 initially flew with German VDM propellers, the Macchi always sported a Piaggio P.2001. Fiat was keen to adopt its licence-built Hamilton unit for the G.55, but the Regia Aeronautica was adamant that the P.2001 would become standardised.

BELOW A 353rd Squadriglia Fiat G.55 pays a flying visit to the Castiglione del Lago fighter school in the summer of 1943. The airfield also served the SAI Ambrosini factory on the opposite shore of Lake Trasimeno, where SAI lightweight fighters and licence-built Macchi fighters were produced.

April 19. Pre-evaluation flight tests were typically short, with the Re.2005 reaching the Guidonia test centre after 14 flights and the MC.205V after just seven. Ministerial decisions were typically slow in coming, with the committee concluding its examination on December 28.

THE FIAT REACTION

If the performance data showed the types to be very similar — unsurprising, given they shared the same engine, propeller, armament, instrument fit and radio equipment — the results confirmed without doubt that Macchi enjoyed, if not total superiority, at least the clear preference of the pilots (see table on page 28). If all went well, the first production machines would reach the front in the second half of 1943, more than two years after Pricolo had originally sounded his alarm. The time wasted reflected the apparent lack of understanding that Italy was involved in a global conflict rather than the limited summer campaign Mussolini believed he was joining in June 1940.

As far as Fiat was concerned, providing the Regia Aeronautica with the best possible fighter came a poor second to defending its share of the fighter market, which during June 1940–December 1942 dropped to 36.15 per cent while Macchi's rose to 18.94 per cent (46.58 per cent including its Breda and SAI licences). Because securing orders for its new fighter was vital to its business, Fiat continued to press for production of its G.55 even after the Ministry had made its decision, and delayed its MC.205V production commitments as much as it possibly could.

The Turin giant apparently hoped that its repeated promises of ever-greater performance from the G.55 and its derivatives might alter the type's poor ranking during the comparative trials. At least, this is what the Fiat-Macchi meeting minutes suggest, not just because the company stalled on questions of configuration (limited to a few engine installation details) and related administrative issues, but because of a suspicious similarity with the contents of a generals' meeting

AUTHOR'S COLLECTION



Following the September 1943 armistice, the German occupying forces allowed Italian industry to fulfil production of aircraft already at an advanced stage of completion. The Aeronautica Nazionale Repubblicana of Mussolini's puppet Italian Social Republic thus received a number of MC.205Vs, as seen here, and G.55s, assigned respectively to the 1st and 2nd Gruppi.



held on March 25, 1942. On this occasion, it was restated that "Fiat must complete the already issued order for 300 MC.205Vs and prepare the G.55 prototype" and that "possible orders" for the G.55 were subordinated to test results. At this point, Bernasconi asked whether, in the event that the G.55 should perform well, its adoption would be postponed until after comparative tests with the Re.2005 and MC.205N. Fougier replied that should the competitors be unreasonably delayed, G.55 orders would not be postponed, but that until that point it should be "clearly stated to Fiat that whatever the results of the G.55 [trials], it will have to build the MC.205Vs ordered [in November 1941]".

Fiat was saved from potential embarrassment by a providential British raid which in November 1942 damaged the CR.42 and MC.205V assembly areas, followed by the loss of the MC.205V pattern aircraft in another attack on December 8. (A rumour, still circulating at Macchi some 40 years later, claiming that damage analysis showed that the bombs had exploded from within the factory rather than outside it, is probably just a myth; but its very persistence illustrates the bitterness of the competition between the Turin industrial giant and the sophisticated Varese artisans at Macchi.)

By the time of the raid on Turin, decisions had been made anyway. Not only had a first order for 600 G.55s been issued to Fiat on November 16, 1942, but on February 22 the following year Bruno explicitly told his German colleague, *Generalmajor* Heinrich-Sigismund von der Heyde, Chief of the Planning Office of the Luftwaffe, that "for fighters we were oriented towards the G.55 as the main type, but that, in consideration of the fact that some companies were already building Macchis, a transitional period based on further Macchi production had been considered

indispensable until it was possible to switch to the G.55".

The Fiat share of the fighter market for January—May 1943 had climbed back to 40.72 per cent, with Macchi dropping to a cumulative 34.66 per cent. Even this did not seem to make Fiat happy, for, in addition to employing its own (albeit licence-built) engine, the company would also have liked to use its own (licence-built Hamilton) hydromatic propeller, in contrast with ministerial standardisation directives. This is borne out by the minutes of a meeting of September 23–24, 1942, which record that Fiat intended to continue using its own propellers "contrary to instructions already issued and confirmed" by the Regia Aeronautica to equip the G.55 with the Piaggio P.2001 units fitted to the Macchi fighters.

By late 1942 the DB 605-powered fighters were no longer deemed to be "next generation" types, but rather an interim group to bridge the gap until new DB 603-powered types could be delivered.

INTO SERVICE

The 17th Gruppo of the 1st Stormo received its first examples of the MC.205V, named *Veltro* (Greyhound), in February 1943, taking them into combat on April 7. With the appearance of the MC.205V, development of the MC.205N *Orione* was set aside. Two *Orione* prototypes were built, however, the first making its maiden flight on November 1, 1942. The *Orione* eventually metamorphosed into the DB 603-powered MC.206, which never flew.

The first production G.55 took off from Turin on April 10. Meanwhile, the Ministry continued to receive proposals from Fiat for "ghost" aircraft. At the generals' meetings of March 3 and April 12, 1943, it was stated that studies were already under way for a proposed G.55 armed with

FIAT G.55, MACCHI MC.205N, MC.205V & REGGIANE Re.2005 DATA

	Fiat G.55	Macchi MC.205N	Macchi MC.205V	Reggiane Re.2005
Dimensions				
Span	11.85m (38ft 10in)	11.25m (36ft 11in)	10.85m (35ft 7in)	11m (36ft 1in)
Length	9.37m (30ft 9in)	9.55m (31ft 4in)	8.85m (29ft 0in)	8.91m (24ft 3in)
Height	3.77m (12ft 4in)	3.25m (10ft 8in)	3.04m (9ft 11in)	3.15m (10ft 4in)
Wing area	21.11m ² (227ft ²)	19m ² (204ft ²)	16.8m ² (181ft ²)	20.4m ² (220ft ²)
Mean wing chord	1.78m (5ft 10in)	—	1.59m (5ft 3in)	—
Loading				
Wings	175.5kg/m ² (35.95lb/ft ²)	—	194.5kg/m ² (39.84lb/ft ²)	175kg/m ² (35.84lb/ft ²)
Power				
at 5,800m (19,030ft)	2.97kg/h.p. (6.55lb/h.p.)	—	2.73kg/h.p. (6.01lb/h.p.)	2.89kg/h.p. (6.37lb/h.p.)
Weights				
Empty	2,700kg (5,953lb)	2,695kg (5,942lb)	2,581kg (5,690lb)	2,600kg (5,732lb)
Payload	1,010kg (2,227lb)	926kg (2,042lb)	827kg (1,823lb)	974kg (2,147lb)
Max take-off	3,710kg (8,179lb)	3,621kg (7,983lb)	3,408kg (7,513lb)	3,610kg (7,959lb)
Performance				
Max speed				
at 7,000m (23,000ft)	620km/h (385 m.p.h.)	628km/h (390 m.p.h.)	626km/h (388 m.p.h.)	628.5km/h (390.5 m.p.h.)
Climb to 6,000m (19,700ft)	7min 12sec	6min 7sec	5min 3sec	5min 30sec
Service ceiling	12,700m (41,650ft)	11,250m (36,900ft)	11,350m (37,250ft)	12,000m (39,400ft)
Range	1,200km (745 miles)	—	—	1,250km (775 miles)

30mm cannon and powered by a DB 603 engine (the type would later be redesignated G.56); indeed, by 1945 fighter production would be concentrated on the G.56 with the fighter-bomber role to be filled by the G.57 with a 1,230 h.p. Fiat A.83 RC.24-52 radial engine.

These ambitious goals called for orders for 3,000 additional G.55s, including 1,800 from the Fiat group (with two manufacturing “rings” in Piedmont and Tuscany) and 600 each from Macchi and Piaggio. The programme, which, according to a Fiat table dated April 1943, would have yielded a monthly output of 220 fighters from November 1944, remained on paper. More importantly, it would have brought the two competitors under *de facto* Fiat control.

These Fiat figures were always hopelessly optimistic, bearing in mind that its aero-engine division was barely able to supply 75 DB 605s a month. This is a clear indication of the lack of a system-wide approach, which the huge G.55 programme would only have exacerbated and extended into every related field, from training to fuel. To return to 1943, suffice to say that while by the end of the year Macchi had met its limited target of 250 MC.205Vs, Fiat had stopped at about 30 of the 275 planned G.55s and never completed any of the planned 185 MC.205Vs.

To add to the absurdity of the situation, on February 23, 1943, von der Heyde asked for three

G.55s — “even if without engines” — for testing in Germany; Gen. s.a. Eraldo Ilari was forced to reply that he would do “everything possible to supply at least one airframe and that the shipment could be made in all likelihood at the earliest date”. In reality, the Luftwaffe never received anything and seized its three G.55s directly at the factory after the armistice.

THE REAL WINNER

Apparently no consideration was given to converting Breda and SAI Ambrosini to MC.205V production, both of which had built the MC.200 and MC.202 under licence. This could have been a simple solution given the significant commonality of parts across the Macchi family, similar to that of the Spitfire Mk V and IX. In terms of overall industrial efficiency, this evolutionary approach would have allowed existing tooling to be re-used, more than offsetting the 13 per cent “complexity handicap” which the MC.205V was estimated to have over the G.55. But the grandiose renewal scheme dreamed up by the Ministry called for Breda to produce the BZ.300 family of Cant Z.1018 derivatives, while Ambrosini would build its all-wood SAI 207 light fighter or SAI 403 derivative. Not only did both designs come to naught, but the production switch implemented the inevitable loss of production during the transition and tool-up period.

Although the Macchis in the background look considerably more modern than the Messerschmitt Bf 109G seen here being prepared for flight, it was the latter type that became the most numerous DB 605-powered fighter in Italian service, self-inflicted production problems forcing Italy to turn to Germany for assistance; a sorry symbol of the failure of Italy's wartime domestic fighter programme.

AUTHOR'S COLLECTION



“IN 1939 GERMANY HAD SUGGESTED THAT ITALY ADOPT THE JUNKERS Ju 88, Ju 87 AND MESSERSCHMITT Bf 109; THE OFFER WAS TURNED DOWN. IN 1943, NEEDING TO FILL THE HUGE GAPS IN ITS ORDER OF BATTLE, ITALY ASKED GERMANY TO PROVIDE THE MOST RECENT VARIANTS OF ... THE Ju 88, Ju 87 AND Bf 109”

As to the final entrant, Reggiane, the solution found was purely nominal: it would build not fighters but “fighter-bombers”, to the tune of 634 Re.2005s and 750 Re.2002s. Essentially, despite all the talk of standardisation and the time-consuming evaluation process, it was decreed that all three “Serie 5” types would be built, one way or another.

But even this would never come to pass. In the event, Italy had to turn to its ally for immediate help. The situation had come full-circle; in 1939 Germany had suggested that Italy adopt, and possibly manufacture under licence, the Junkers Ju 88 bomber, Ju 87 dive-bomber and Messerschmitt Bf 109 fighter, each of which offered a better combination of flying and military qualities than those of Italy's indigenous designs. The offer was turned down. In 1943, unable to overcome its shortcomings and needing somehow to fill the huge gaps in its order of battle, Italy asked Germany to provide ... the most recent variants of the Ju 88, Ju 87 and Bf 109.

After the war Fiat would trumpet the myth of “the best Italian fighter of the war” (as Gabrielli referred to his G.55 in his 1982 memoir), Macchi would feature as the epitome of seamless evolution and Reggiane would be cast as “the outsider”. All parties, however, tend to brush aside the fact that the situation at the front had become tragic.

On March 5, 1943, Fougier noted sadly that his front line consisted of barely four *Stormi* of MC.202s. The generals had decided to use the inadequate Re.2001 for “fighter defence”, together with captured examples of the French Dewoitine D.520 and the now-archaic MC.200. After four years of dreams and promises, Italy's fighter line had finally reached a full stop.



ACKNOWLEDGMENTS *The author would like to thank Giulio C. Valdonio, Gianni Cattaneo, Giancarlo Garelo, Baldassare Catalanotto, Maurizio Longoni, Giovanni Massimello and the late Giorgio Bignozzi for their invaluable help with the preparation of this feature*



Echoes from Dawn Skies

A Lost Manuscript Rediscovered

THE STORY SO FAR: Shortly before his death in 1956, aged 76, renowned pioneer pilot and flying instructor F.W. Merriam — who in 1912 was the first man to fly an aeroplane through cloud — completed a book manuscript, entitled *Echoes From Dawn Skies*. It comprised recollections of the early years of flying, gathered from his contemporaries, many of whom had by then become leading figures in the aviation world.

Seeking “to present a more personal and intimate picture than has yet been produced”, Merriam had asked them each to “contribute a story of a personal nature, something that had never before been published”.

The result was a treasure-trove of fresh, first-hand insights into the lives, the work, the unquenchable spirit and the humour of these early flyers. Sadly Merriam died before the book could be published, and the priceless manuscript vanished into obscurity for more than half a century . . . until, in the summer of 2013, it came to the attention of *The Aviation Historian*. Merriam’s granddaughter, Sylvia Macintosh, aware of the manuscript’s importance and keen to see it finally in print, discovered *TAH* and got in touch with Managing Editor Mick Oakey, who immediately set the wheels in motion. As Mick says, “Reading the material today is the next best thing to teleporting back in time and sharing a pint or a convivial dinner with these remarkable men”.

Merriam introduces his chapter on Ronald Kemp and Frederick Raynham, published for the first time here, with these words:

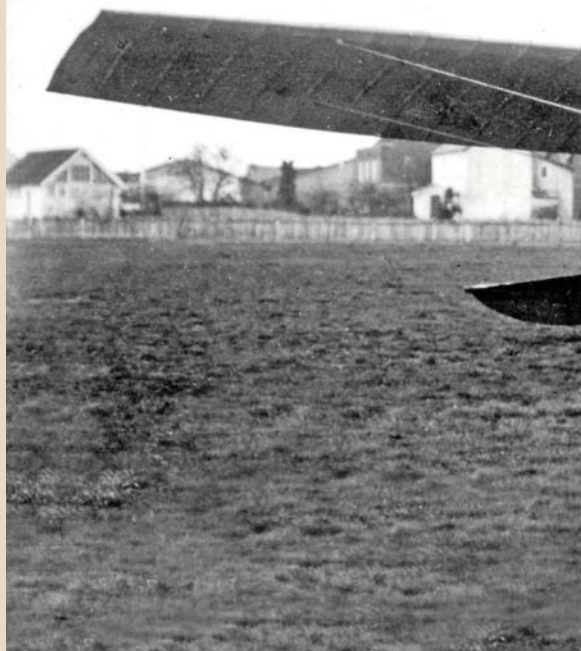
“It was through a relative of his, Major F. Roe AFC, a war pupil of mine, that I was able to contact Ronald Kemp, who should be proud of so early a ‘ticket’ [Royal Aero Club Flying Certificate], No 80. Apparently Kemp has no aeronautical letters to his name, yet, I know many who have a string of them for doing much less for aviation than he. Kemp’s contribution to these pages brings to light several of the forgotten pioneers who faded out many years ago, but who nevertheless played an important part in the foundation of aeronautics. I can still see them in their shirtsleeves, slogging away at their experiments . . .”

Unfortunately Raynham died before he could send Merriam his memories of the early days, so Kemp opens Merriam’s chapter on the pair, and Raynham’s sister Bertha provides some afterthoughts on her brother’s achievements . . .

The fifth part of our exclusive serialisation of **FREDERICK WARREN MERRIAM’s** unpublished volume of collected early-aviation memories, *Echoes from Dawn Skies*, celebrates the contribution made to the test pilot’s art by two of its earliest and most distinguished exponents — Ronald Kemp and Frederick Raynham, who together formed the Air Survey Co Ltd in India in 1924. Kemp leads off with his recollections of Britain’s pre-Great War pioneers

MAIN PICTURE *The first non-airship aircraft built by Vickers was a series of seven monoplanes based on designs by Robert Esnault-Pelterie, with fuselages made of steel tubing braced with piano wire and covered with fabric. Seen here is Monoplane No 2, later acquired for use on the 1912 Australian Antarctic expedition.*

PHILIP JARRETT COLLECTION



BIRDS OF A FEATHER

RONALD C. KEMP (1890–1978) & FREDERICK P. RAYNHAM (1893–1954)

ROYAL AERO CLUB TRUST



ABOVE *Ronald Campbell Kemp was born in Cultra in County Down, Northern Ireland, in 1890. He gained his Royal Aero Club "ticket", for which this is the photograph, on May 9, 1911.*

THERE ARE TWO thoughts that often come into my head about the early days of aviation. What would the designers have thought, and what would they have done, had one been able to picture for them the misuses to which aircraft have been put? I am fairly sure they would have thrown it up altogether. And how would aircraft have developed without the two World Wars? Progress before the First World War was a search for aerodynamic efficiency by quite a number of keen designers, all hoping to get away with as little power as possible. When the war came along this gave way to a scramble for more and more power, and certainly, for a time, it became flying by brute force.

All those valuable designers, with the exception of a well-known few, were lost to the industry. They never went back into it again. At Brooklands, besides A.V. Roe and Tommy Sopwith, there was José Weiss, Howard Flanders, H.P. Martin and George Handasyde, the Petre brothers, R.F. Macfie, Blondeau and Hewlett — all excellent designers. And there were many others. Archibald R. Low designed the first Vickers, which, of course, was subsequent to the R.E.P. types. That machine, as it happened, gave me my first experience of violent centre-of-pressure travel, causing uncontrollable and differential wing-warping, which stood me in good stead in later years





at Farnborough, when the B.E.2 was made exceptionally stable. There was also the bunch of exceptionally keen pilots who did some noble experimental work. [Edward] Petre, [E.V.B.] Fisher and [F.P.] Raynham, for example, did an immense amount of useful work on a very early type of Hanriot.

I expect it was experience of that sort, which taught Raynham and others to have such a full appreciation of design problems, that eventually produced the perfect test pilot. Raynham must have acquired much more in his early training, and ran a branch of the business [Air Survey Co Ltd] in India which he built up, almost single-handedly, into a most efficient organisation. I have been most grateful ever since.

It is odd that one thinks of early aviation solely in terms of pilots and designers, and quite forgets the engine man. Two staple types to fall back on in British manufacture at that time were the Green and JAP engines. Mr Green and Mr Day of the former, and Mr John A. Prestwich of the latter, were frequently at Brooklands helping all they could. There was also Jack Alcock, later Sir John of transatlantic fame, with the Empress rotary engine.

ROTARY ENGINE? NO SUCH THING!

Mention of rotary engines, incidentally, reminds me of when I was running a training school in Calcutta during the Second World War. The Air Ministry sent me two instructors, one airframes, the other engines, and the engine man would not believe there had ever been such a thing as a rotary engine!

For a time, during the Brooklands days, I was instructing at Amesbury, in preparation for being sent out to teach German officers to fly. I really believe the German War Office officials, in selecting the trainee pilots, must have pricked an army list with a pin 20 times. Those pilots certainly seemed a ham-handed lot to me.

My world of aviation in those days was mostly



PHILIP JARRETT COLLECTION v2

Brooklands, Amesbury and Farnborough, but there were men all over the country designing and piloting their own aircraft.

The one in Ireland I remember was Harry Ferguson (seen **ABOVE**). He had the idea that the right way to control an aeroplane was that the stick should go whichever way the body was inclined to fall. If your nose went down and you fell on your stick then you would automatically right the aircraft. The same rule was also applied to lateral control.

Ferguson asked me to test his aircraft, but when I was confronted with this contraption I am afraid I funkied it. He very kindly altered the controls to the orthodox style, with the exception that he had the fore-and-aft control with the stick

Harry Ferguson sits in the cockpit of the first version of his monoplane at Hillsborough, near Belfast, in 1909, while Leslie Wilkinson primes the eight-cylinder air-cooled JAP engine. On December 31 that year Ferguson made a 130yd flight in a much-modified monoplane to become the first Irishman to fly.





The unorthodox Royal Aircraft Factory F.E.3 (also known as the A.E.1) of 1913 was developed to accommodate a single Coventry Ordnance Works (C.O.W.) one-pounder gun. Powered by a 100 h.p. ENV water-cooled inline engine in pusher configuration, the F.E.3 was fitted with a single tailboom supported on bearings at the end of the propshaft and attached by wires to the upper wing and undercarriage.

on the starboard side, and the lateral control with another stick on the port side. I am afraid I got a little confused and tried to make them go both ways, but the test was completed.

FARNBOROUGH FROLICS

Farnborough has always been interesting. Many wild experiments have gone on there. I remember the F.E.3 [A.E.1] with a single-boom tail held in position with wires from the wings. It became my special pigeon for some reason or other, and it was stated it was a dour aircraft, and only wagged its tail when I came to work in the morning. It certainly did. Once, Raynham, bringing an Avro 504 into Farnborough from Brooklands, slid up alongside me in an endeavour to make me do something reasonable in the way of a manoeuvre, but I dared not attempt anything with that fantastic tailboom.

The Short brothers settled down to seaplanes almost entirely in the end, but during the First World War they made one breakaway. They converted a seaplane into a bomber by putting an undercarriage on it and extending the wings from 62ft (19m) to 84ft (25m) in order to carry the load. That did it, but the machine was mighty difficult to fly because of the shortness of the fuselage in relation to the wings.

Many a battle we had with Horace Short to try and get him to alter the fuselage. Eventually a very naughty scheme was evolved, largely in the Admiralty by [Arthur] Longmore. Horace



ABOVE A 1930 photograph of Ronald Kemp (furthest right) beside a Fairey III of the Air Survey Company he established with Frederick Raynham in 1924. Alongside Kemp are two directors of the company: Sqn Ldr Maurice Wright (centre) and Mr A.G. Hazell.

Short was invited to Belgium see the Western Front. A special destroyer took him from Dover to Dunkirk, and while he was away we got very busy with a hacksaw. The fuselage was cut in two and an 8ft 6in [2.6m] section was added.

All went well until the secretary of the company, feeling there was something going on which did not appear quite right, sent a telegram to Short. But he was too late. We had had our test and the contract was secured.



ABOVE Frederick Raynham was born in Suffolk on July 15, 1893, and after working with J.V. Neale at Brooklands from late 1909, joined A.V. Roe, also at Brooklands, in 1911. Raynham's Royal Aero Club Certificate, No 85, carries the same date, May 9, 1911, as that of Ronald Kemp, with whom Raynham later established the Air Survey Co Ltd.

FREDERICK PHILLIPS "FREDDY" RAYNHAM

MERRIAM CONTINUES the story of these two important pioneers with the following words on Raynham, who, in company with Kemp, formed Air Survey Co Ltd with Armstrong Siddeley Puma-powered Airco D.H.9 land- and seaplanes in the autumn of 1924:

"Ronald Kemp and Freddy Raynham were partners and went to India with their aircraft where they undertook air-survey work. If my memory serves me rightly they were the first experimenters of agricultural spraying there.

"I was seeking Freddy Raynham for a sequel to Kemp's story when the news came of his death in America while on a caravan tour with

his wife. This was a great shock to all who knew him. He was one of the youngest of our vintage and has left us before it was his turn. I regret to say, his passing has robbed these pages of a personal 'write-up'. The next best thing, however, comes from Mrs Bertha Underwood, who pays the following tribute to her brother, one of our earliest test pilots."

Bertha wrote: "Freddy gained his 'ticket' in May 1911. He had practically taught himself to fly on one of A.V. Roe's early machines. His enthusiasm was so great that he had worked in the Brooklands sheds for Mr Roe for nothing, on condition that he could have the use of a

One of the Armstrong Siddley Puma-powered Airco D.H.9s, either G-IAAQ or G-IAAS, used to map the Irrawaddy River by Kemp during 1923-24, and subsequently used by the Air Survey Co Ltd.





ABOVE The Martinsyde Raymor was built specifically for Raynham and C.F.W. Morgan's bid to claim the Daily Mail prize for the first non-stop transatlantic flight. Here Morgan clammers aboard as Raynham warms the engine just before their first failed attempt on May 18, 1919. **BELOW RIGHT** John W. Alcock in a Maurice Farman in 1914.

machine for 20min a week. He was 17 at the time, but it was only a few weeks before he was able to qualify for his certificate, No 85.

"After that he was flying continually and taking part in most of the competitions and races organised before the First World War. During the war he was testing machines for the Royal Flying Corps. Then in 1919 he made a transatlantic attempt in the Martinsyde aeroplane. He was the next to take off after Harry Hawker, but crashed through being overloaded. Immediately he proceeded to repair the machine for another attempt. By the time the repairs were complete Alcock and Brown were also ready for the attempt. Again he was unlucky. A gust of wind forced him down on to a mound as he was taking off, and the machine was wrecked for the second time.

"Looking back it seems extremely fortunate that no lives were lost by competitors in that hazardous undertaking. Later they all had a very happy reunion dinner in London, when the menu recalled the many jokes they had shared during the long weeks of preparation and waiting for the right weather at St Johns in Newfoundland.

"Freddy's work later took him to most parts of the world, and from 1939 he served in the Royal Air Force as a member of the Accident Investigation Branch."



Merriam rounded off his chapter on two of Britain's most important test pilot pioneers with a sobering tribute to two others:

"Alcock and Brown, mentioned in the foregoing, as everybody knows, were the successful competitors in the *Daily Mail* transatlantic competition and were knighted for this accomplishment. Sir John Alcock, however, did not survive long after. He was killed, as a result of fog, while on a flight to France."



NEXT TIME

In the next instalment of *Echoes from Dawn Skies*, Supermarine test pilot Henri Biard recalls the perils of drinking several strong cups of tea before a long delivery flight . . .



SELL IT TO THE MARINES

In the first half of a two-part section on the procurement and career of the US Marine Corps' AV-8A Harrier variant, **CHRIS FARARA** explains how the surprise arrival of three US Marine Corps officers at Hawker Siddeley's chalet at Farnborough in 1968 set the wheels in motion for a fruitful — if initially controversial — British/American collaboration

WHEN THE PROTOTYPE Hawker P.1127 made its first tethered flight in November 1960, with test pilot Bill Bedford at the controls, the American military was quick to realise the potential of the radical new “jump-jet”, and in October 1964 pilots from the US Navy, Army and Air Force were selected to participate in trials of the Kestrel FGA.1 development of the P.1127 as part of the Tripartite Evaluation Squadron.

Back in January 1963 a collaborative agreement between Hawker Siddeley Aviation (HSA) and the Northrop Corporation's Norair Division in Hawthorne, California, had been signed. The objective was to develop and promote a US Army version of the promising VTOL jet fighter. Project design work was undertaken, under the aegis of designer Ralph Hooper at HSA's Kingston factory and George Grogan Jr at Norair, on a Kestrel with a 21,000lb-thrust Rolls-Royce Pegasus engine and a large rear-fuselage avionics bay with fully-

stressed fuselage-side doors. The latter found its way on to the Harrier, and is still there on the McDonnell Douglas/BAe Harrier II. Apart from this, the collaboration came to naught when, after years of rivalry, the US Army lost its battle with the USAF and the American government decided that fixed-wing close-air-support would be a USAF responsibility. The Army had no option but to abandon its plans to procure the P.1127.

“Hello. We'd like to fly your Harrier . . .”

Five years later, at the 1968 SBAC Farnborough Air Show, Bill Bedford, by this time Kingston's Harrier Sales Manager, met three US Marine Corps (USMC) officers — Brig Gen W.G. Johnson, deputy head of USMC aviation, and two test pilots, Col Tom Miller, Head of Air Weapons Systems Requirements and Major Clarence “Bud” Baker, Head of the Fighter Section — who had come to fly the Harrier.

A member of Miller's staff, Maj John Metzco, had been following the progress of the P.1127 and

Fourth production AV-8A BuNo 158387 of VMA-513 is demonstrated by Capt Arthur Hall, a USAF pilot on exchange with the USMC, at Beaufort, South Carolina, in the spring of 1971. The unit's operations were based at "Hoot's Halfacre", the first half of the name deriving from VMA-513's owl insignia, the second from the space occupied by the squadron's hangar.

TAH ARCHIVE





TAH ARCHIVE

ABOVE America's first encounter with the Harrier was during the Daily Mail Transatlantic Air Race, held to commemorate the 50th anniversary of Alcock and Brown's flight in 1919. Here XV741 alights at the corner of FDR Drive and East 26th Street in New York City after a 6hr 11min flight from London's St Pancras station on May 5, 1969.

Kestrel and was becoming increasingly aware of the Harrier's likely suitability for the USMC. In addition, Allied Research Associates (ARA), founded by Massachusetts Institute of Technology graduate Laurence Levy to develop defence contracts between Nato nations, established a joint venture with HSA to promote collaborative defence projects between the UK and America. Consequently, ARA had been discreetly providing Harrier data to Miller's office via the British Embassy in Washington DC.

Miller firmly believed that the Marines should evaluate the Harrier, and put such a proposal to his boss, Maj-Gen Keith B. McCutcheon, Deputy Chief of Staff, USMC Air HQ. In turn, McCutcheon convinced the USMC Commandant, Gen Leonard Chapman, that evaluating the Harrier could pay dividends. Thus three officers set off for Farnborough under the cover of a standing invitation from HSA to fly the Andover transport which had recently been under consideration as a replacement for the US Marine Corps' ageing Douglas R4Ds. This plan to spend defence funds overseas had been dismissed out of hand, hence the need to keep the Harrier activities secret lest it should prematurely suffer the same fate.

The officers arrived unannounced at HSA's Farnborough chalet during the SBAC show in September 1968. When they announced that the



VIA PETER B. MERSKY

ABOVE "The father of the AV-8A" — Lt-Gen Thomas H. Miller was one of America's most distinguished naval aviators, having served as a USMC combat pilot in three major conflicts; he flew Wildcats and Corsairs in the Pacific War, Corsairs in Korea and commanded F-4 unit VMFA-513 in Vietnam. Miller was the driving force behind the USMC's adoption of the Harrier.



ABOVE Harrier XV742 was used extensively by USMC pilots during the early days of the AV-8A procurement process and is seen here in Marine Corps markings carrying an 8,000lb bomb load during trials. It was given the civil registration G-VSTO in 1971 for demonstration flights in Switzerland, as recalled by John Farley in TAH7.

US Marine Corps wanted to buy the Harrier and that they would like to fly it next week, they were — unsurprisingly — not taken entirely seriously by the junior staff member who greeted them. Bill Bedford, however, recognising the importance of this encounter, briefed them on the aircraft and immediately set about making a formal assessment happen. Working from the chalet he secured British government approval for the evaluation from Air Cdre Reginald Harland, Director of Harrier Projects, and booked the pilots and their wives into the Angel Hotel in Guildford for the week beginning September 23, the day after the Farnborough show closed. Kingston's General Manager, John Glasscock, gave approval for the company effort and the Ministry of Technology (MinTech) loaned Harrier GR.1 XV742 free of charge and authorised the two USMC pilots to fly.

Tom Miller and Bud Baker each made nine familiarisation and evaluation Harrier flights, seven of which explored the V/STOL envelope and two of which were conventional. On one of the flights the aircraft carried two 1,000lb bombs and a pair of rocket launchers. Both pilots were impressed by the Harrier and criticisms were limited to only minor points. At the post-trial conference Miller said: "In my opinion the Harrier is a fine aircraft and I have enjoyed the experience of flying it". Baker added, "I would go along with

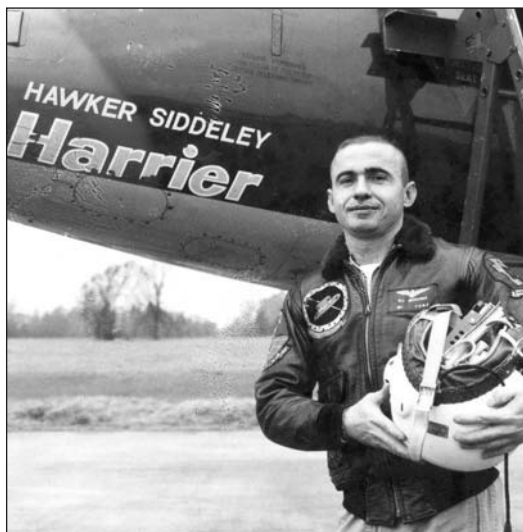
that. It is a fine aircraft and I was struck by the ease of transition; also by the high level of serviceability achieved during these trials". Both pilots were convinced that the Harrier was ideal for the USMC mission.

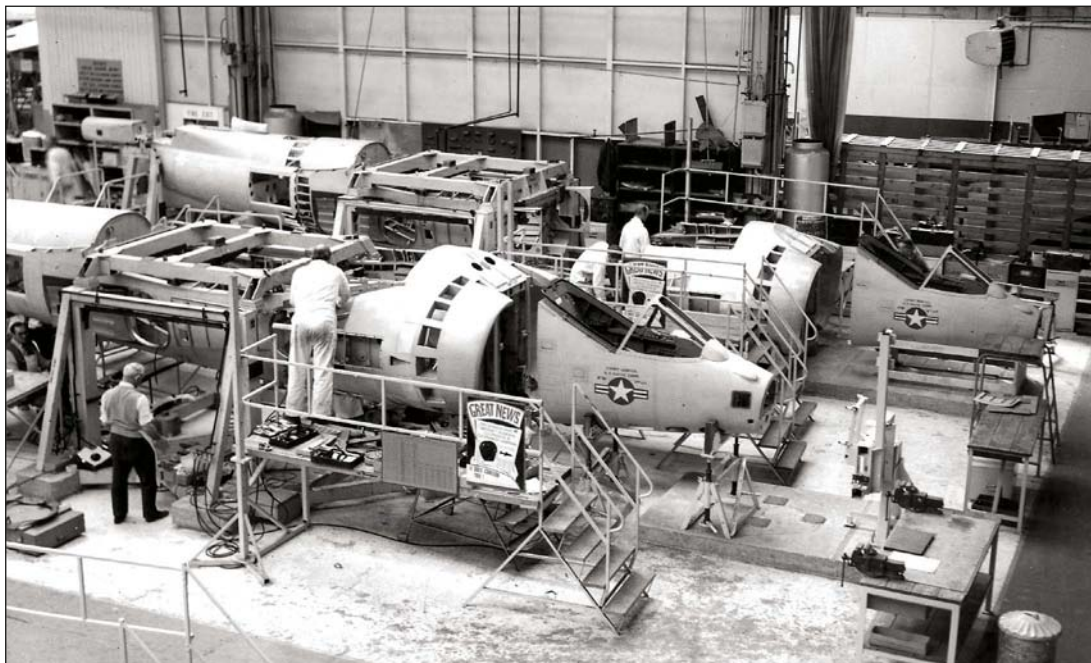
Harrier horse-trading

Back in America Tom Miller reported to Leonard Chapman, advising the USMC Commandant of the Harrier's suitability for the Service's close-support role. Chapman decided to try to get an initial buy of 12 Harriers into the 1969 American defence budget. The USMC is part of the US Navy and its equipment is paid for out of the USN budget, so the first task was to persuade the Navy that the purchase was necessary. The Secretary of the Navy finally agreed, provided that no funding additional to the existing budget was involved. Next, Department of Defense opposition, on the basis of erroneous performance data, was overcome by Miller, supported by HSA.

Tom Miller also got the tough job of lobbying industry on behalf of a foreign aircraft that would potentially take away millions of dollars' worth of business from American companies. He had to persuade these companies of long-term benefits to the industry and stop their state congressmen and senators from blocking the purchase.

A particularly knotty problem was McDonnell





ABOVE The third and fourth AV-8As, BuNos 158386 and 158387, on the production line at Kingston. The former made its first flight on February 3, 1971, and was delivered to its new owners in the USA on March 15. The latter followed it into the air on February 16 and arrived at the US Navy Test Pilots' School at Pax River on March 12.

Douglas in St Louis, Missouri, known as McAir. Because of the Navy ruling on no additional funding for the Harriers, the USMC had chosen to sacrifice its \$58m F-4J Phantom attrition buy for the year. On Miller's side were two salient points: he was personal friends with McAir's top management at St Louis, and he was a Phantom pilot — he had set the 500km closed-circuit world air speed record at 1,216.7 m.p.h. (1,957km/h) in an F-4A in September 1960.

Back in the UK, the Harrier was cleared to carry and release American stores by HSA at Dunsfold and the Aeroplane & Armament Experimental Establishment (A&AEE) at Boscombe Down. In January 1969 four experienced USMC pilots — Cdr Bob Thomas, Maj Bill Schieren, Capt Mike Ripley and Lt Tom Casey — arrived in the UK to fly Harrier XV743 in extensive evaluation trials, all of which were completed successfully.

By the end of his campaign Miller had won the support of the American aircraft industry and McCutcheon's standing among the establishment had turned the tide with Congress. A licence agreement for Harrier manufacture by McDonnell Douglas ended the argument. In the event, all 102 Harrier Mk 50 AV-8As and eight two-seat Harrier Mk 54 TAV-8As were built at Kingston because the American procedure of ordering in annual

batches meant that it was never economical to transfer production to St Louis.

Production AV-8As were fitted with American radio equipment and carried AIM-9E Sidewinder air-to-air missiles on the outboard pylons. In later aircraft, and retrospectively, the Ferranti inertial platform-based nav-attack system was replaced with a simpler and more easily maintained two-gyro attitude and heading reference system more suitable for the USMC's operating environment.

All the aircraft were assembled and flown at Dunsfold, after which they had their wings taken off and were flown to the USA aboard USAF Lockheed C-133 Cargomasters or C-141 Starlifters, undoubtedly the largest aircraft ever to use HSA's airfield. To make it possible the Starlifters took off with a reduced fuel load and filled up at Mildenhall before the transatlantic leg.

The Harrier's secret weapon

The Marines worked the Harrier with great enthusiasm to its full potential, especially in air combat, in marked contrast to the RAF, which saw the aircraft only in the ground-attack and reconnaissance roles. (See pages 48–55 for the AV-8A's Service career). Led by Maj Harry Blot, the Marines developed tactics using nozzle-vectoring in forward flight (VIFFing) to enhance

PREVIOUS PAGE, CLOCKWISE FROM TOP LEFT Cdr Bob Thomas, who led the US Naval Preliminary Examination (NPE) team at Dunsfold in January 1969; Lt Tom Casey, seen here taking advice from HSA test pilot John Farley; Maj Bill Schieren, another member of the NPE team, beside XV743 (bottom picture), which was lost later the same month while being flown by a USAF pilot; Capt Mike Ripley, who was killed in AV-8A BuNo 158386 in June 1971.




ABOVE Sir Arnold Hall, Chairman and Managing Director of Hawker Siddeley, and Frederick Corfield, Minister of Aviation Supply, exchange paperwork during the handover ceremony of the first AV-8A at Dunsfold on January 6, 1971, at which AV-8A BuNo 158385 displayed briefly (BELOW) before an engine surge forced it to retire for the day.

the type's combat agility. The first formal VIFF flight testing had been undertaken using the NASA Langley Kestrel in 1971, which included air combat manoeuvring (ACM) trials against a Northrop T-38. The results were so encouraging that intensive trials were undertaken jointly by NASA and the UK's Ministry of Defence, with HSA participation, in 1972.

A Harrier from the GR.1 Development Batch was fitted with a strengthened nozzle-drive system permitting VIFFing at all speeds and power settings. Engineering trials were flown from the A&AEE airfield at Boscombe Down, and ACM trials against a Hawker Hunter, F-4M and a non-VIFFing Harrier were performed over the instrumented RAE range at Aberporth. The results showed that a VIFFing Harrier would usually win an ACM engagement against an afterburning fighter or at least force a draw by making

the opponent break off owing to fuel shortage.

In 1979 the CILOP (Conversion In Lieu of Procurement) and SLEP (Service Life Extension Program) processes were implemented. The former introduced new systems including chaff and flare dispensers, radar warning receivers, secure voice radio, on-board oxygen generation, and gun pod strakes and a retractable cross dam to improve VTOL performance. The modified aircraft were designated AV-8Cs.

The USMC operated its innovative "jump-jet" from 1971 until 1987; so pleased were they with it that they demanded a second-generation V/STOL close-support fighter in the same mould; the McDonnell-Douglas/BAe AV-8B Harrier II. 

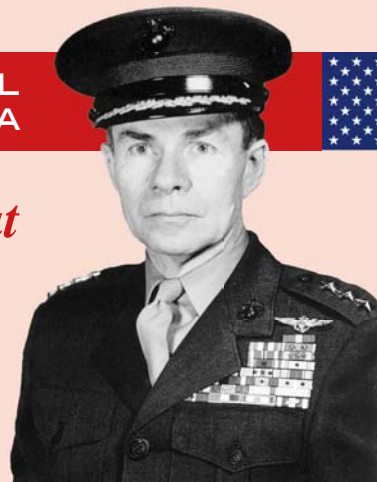
OVERLEAF — American naval historian Lon Nordeen continues the story of the AV-8A with its introduction into service and its career with the "Flying Leathernecks" . . .

CHRIS FARARA





THE USMC'S POLITICAL BATTLE FOR THE AV-8A



*“Do you feel that
the Harrier is
superior or
inferior to the
Phantom?”*

BY THE END of 1969 a US Marine Corps order for 12 Harriers to be used for operational testing had been placed, despite considerable reservations from political quarters. The extracts below are from the US Senate Armed Services Committee hearing on the Harrier in late 1969, and show how hard the case for buying a foreign aircraft for the American armed forces had to be argued. The dialogue is between Senator Strom Thurmond, Republican Senator of South Carolina (ABOVE LEFT), and Maj-Gen Keith McCutcheon, Deputy Chief of Staff, Air, USMC (ABOVE RIGHT).

Sen Thurmond: What were the prime reasons for the USMC becoming so enthused about the Harrier?

Gen McCutcheon: For some time we have had a requirement for a V/STOL aircraft, although we spent a lot of money on about 16 different models. We did participate with the British in the development of the Harrier, and put [deleted] million into the programme. We were also mixed up with the British and the Germans in the US/FRG VTOL aircraft. Outside of the Russian Yak-36 *Freehand*, the Harrier is the only V/STOL aircraft anywhere close to being categorised as an operational aircraft today. The advantages of a V/STOL aircraft are that it gives you much more flexibility in the employment of your attack aircraft; you can move closer to where the battle is. You can reduce response time immeasurably. Because you can move up and fly at more rapid reaction times over shorter distances, you can afford to have smaller loads. In addition, it provides increased dispersal, which, in a war like the one in Vietnam, becomes important when you have only 11 or 12 jet-capable air bases in the whole country. So for the money that we are putting into it, we believe that we will immeasurably improve our capability, flexibility and versatility.

Thurmond: Are you firmly convinced that the interests of the USMC will be advanced by purchasing 12 of these aircraft, recognising that in the process you are giving up the purchase of, I believe, [deleted] F-4Js?

McCutcheon: Yes sir. That is our initial buy.

Thurmond: From the information you have now, do you feel that the Harrier is superior or inferior to the F-4?

McCutcheon: From the studies that we have made for the close-air-support and interdiction missions, we believe that the Harrier is better. If you look at purely the fighter role, I believe that the F-4 is clearly superior, but I reiterate a point that I made earlier. We believe that the Harrier has a capability inherent of being developed to be a day-fighter, so that all things taken together, we will not be giving up as much as you think in giving up F-4s.

Thurmond: What is the unit cost?

McCutcheon: The unit cost is about \$3.5m.

Thurmond: I am wondering if you have considered it a serious problem that you are purchasing an aircraft of foreign manufacture, which in the event of hostilities may make the acquisition of spare parts and other support equipment difficult, if not impossible, to obtain?

McCutcheon: Yes sir, we have gone into this, and we have also considered the balance of payments and the flow of gold in connection with the aircraft; but on the other hand, the ejection seats which we put into the F-4J and F-4B are built in England — not just designed there and built here, but built in England — and we have some other equipment that is also foreign-built. So if we get into a war, these are the things I think we will have to take a calculated risk on.

Thurmond: I understand the Navy sent an evaluation team to England. Does the Navy intend to purchase this aircraft?

McCutcheon: The Navy did send a team to England because the aircraft being procured for the Marine Corps is still procured through the Navy aviation system, and specifically Air Systems Command. I think that at the present time the Navy has no plans, but I will defer to Admiral Connolly on that.

Admiral T.F. Connolly, USN (Deputy Chief of Naval Operations, Air): We plan to carry out what General McCutcheon has been describing. I personally was very, very surprised at how good the Harrier is by comparison with what I thought it might be. It is a really advanced aircraft. As General McCutcheon indicates, it is going to be used in the role of the [Douglas] A-4, not in the role of the F-4, but it is nonetheless a fighter. To answer your question more directly, Senator, I think it is going to depend on these things: the operational value that the Marine Corps puts on the Harrier as it uses the first 12, and the kind of results we get from our Board of Inspection & Survey tests at Patuxent River, combined with the price. I have the view, and I think it is a pretty straight one, that if we ever go into that aircraft in this country in any numbers, it would be on the basis that it would be manufactured in this country under some kind of licence and not in England.

BIRD OF PREY



The AV-8A in US Marine Corps service





Having overcome considerable political resistance to its addition to the USMC inventory, the AV-8A had plenty to prove when it was introduced into Marine service in the spring of 1971. **LON NORDEEN** relates how the unique “jump-jet” quickly became a vital USMC asset, able to operate from strips and ships far beyond the capabilities of other jet aircraft

DURING HEARINGS in the US Senate in 1971, Maj-Gen Homer S. Hill, Assistant Deputy Chief of Naval Operations (Marine Aviation), explained USMC doctrine: “It is important to recall that in the Marine Corps air-ground team, we have struck a careful balance in the number of various types of supporting arms to enable the Marine ground commander to effectively carry out his mission [sic] . . . the Marines have pioneered close-air-support and devoted primary attention to improvements in close-air-support systems, to include the V/STOL Harrier [and the] development of a responsive command and control system. Providing forward air controllers as organic members of the ground force, we are confident that the key factor in the success of our close-air-support system is the balanced force of air and ground weapons under one Marine Corps operational commander”.

The USMC ultimately received a total of 102 AV-8As and eight two-seat TAV-8As during 1971–76. All underwent final assembly and flight-testing at the HSA plant at Dunsfold, after

which they were dismantled and loaded aboard USAF transports and flown to the USA. After their arrival the AV-8As were reassembled and delivered to the US Marine Corps.

Versatile warrior

The AV-8A was similar to the RAF’s Harrier GR.1, the chief differences being that the latter’s magnesium components were removed and the AV-8As were fitted with American radio and IFF (identification) systems, along with outer pylons capable of carrying AIM-9E Sidewinder air-to-air missiles for self-defence. The Martin-Baker Mk 9 ejection seat was later replaced by a Stencel SIIIS example. All but the first ten AV-8As to be delivered (which were fitted with the Rolls-Royce Pegasus 10/Mk 102 — USMC designation F402-RR-400) were powered by the improved Pegasus 11/Mk 103 (F402-RR-401/2) engine, which provided 21,500lb-thrust.

The AV-8A was armed with two 30mm Aden cannon mounted in pods below the fuselage, and could carry a wide variety of weapons on four underwing pylons and one underfuselage

OPPOSITE PAGE Five factory-fresh AV-8As of VMA-513 on the flightline at MCAS Beaufort in the first half of 1971. The first AV-8A arrived in the USA on January 21, 1971, and the last was delivered in November 1976. **TOP** A pair of “Aces” of VMA-231 fly along the distinctive North Carolina coastline near the unit’s base at Cherry Point in 1974.



ABOVE The cutting edge of Marine Corps hardware in 1971; an AV-8A of VMA-513 formates with an A-4 Skyhawk of VMA-324 and an F-4 Phantom of VMFA-251, all up from their common base at MCAS Beaufort. **BELOW** Harriers of VMA-513 in the Mojave Desert during Exercise Battle Cry, a six-week deployment to China Lake during 1972.

hardpoint. With a vertical take-off the AV-8A could carry a weapons load of 1,500lb (680kg) and strike a target at a range of 50 miles (80km). With a short take-off run the aircraft could carry a 3,000lb (1,360kg) payload some 200 miles (320km).

On April 15, 1971, VMA-513 ("The Flying Nightmares"), formerly F-4 Phantom unit VMFA-513, became the first USMC squadron to convert on to the Harrier when its AV-8As were delivered to the unit's base at MCAS Beaufort, South Carolina. Former US Navy pilot Capt Bud Orr recalls joining the first Harrier squadron:

"Admiral Elmo Zumwalt was the CNO [Chief of Naval Operations] at the time, and word got out he wanted a Navy pilot in the first USMC Harrier squadron. I won. Bud Baker was the CO; he had been the right-hand man to Col Tom Miller, who was the father of the AV-8A. I was the third officer to check in to VMA-513. Our first 'planes were delivered in the back of C-141s. The

Marines put the wings on and we started flying them. We checked out night and day."

Bob Nidiffer was a member of the support team of the first AV-8A unit:

"I joined VMA-513 as a young Marine in the engine shop at Beaufort on August 18, 1971, when the squadron had six 'planes. At that time they had the -400 engine, which only lasted about 300hr before it needed a major rework."

Up and at 'em!

Over the course of numerous exercises, USMC AV-8A pilots and support crews showed that the versatile Harrier could fly from roads, damaged runways and open ground. During Operation *Versatile Warrior* (a sortie-rate validation test), flown from Camp Lejeune, North Carolina, in March 1972, six AV-8As of VMA-513 flew 376 sorties over a ten-day period. This was practical evidence that the Harrier could fly more than six





ABOVE A VMA-513 Harrier displays its Sidewinder air-to-air missiles. The AIM-9E was fitted with a scanning infra-red sensor, which scanned independently as there was no radar equipment for it to be slaved to; the advantage was that the AV-8A did not have to be directly behind its adversary, as the missile locked on to its own targets.

sorties a day (on one day the average was 10-2 sorties), be refuelled in 6min, rearmed in 18min and deliver weapons in less than 12min from a forward site during simulated battle conditions.

Former AV-8A pilot Col Greg Kuzniewski recalls his transition to the new jump-jet: "When I started my class to transition to the Harrier in early 1973 there were actually more astronauts than Harrier pilots. We started off in VMA-513 and then stood up VMA-542, and later came the training squadron. Believe it or not, we were rotating the training responsibility. Since I was a qualified Navy Landing Signal Officer, our squadron leadership said, 'Why don't you take over training and instruct pilots from here on out as you have more than 35hr in the aircraft?'"

"So I collected paperwork and other training material from VMA-513 and created a FAM [familiarisation] lecture series and flight syllabus. Eventually HQMC moved all Harrier squadrons

to MCAS Cherry Point in North Carolina to centralise operations. I was transferred to VMAT-203 to help set up the Harrier training squadron as the pilot training officer under the watchful eye of Major 'Nasty' Gibson.

"At that point, we still did not have any two-seat training aircraft; every FAM class was a new and exciting adventure. During this period, VMA-513 was working up for a six-month ship deployment, followed by another six months in Iwakuni, Japan."

Another F-4 unit, VMA-542 ("The Tigers"), became the second AV-8A squadron on January 12, 1972, at Beaufort. In 1975 the squadron moved to Cherry Point and flew the AV-8A/C until 1987. Former VMA-542 pilot Lt-Col Ted Herman remembers the extensive training required to be a Harrier driver:

"I transitioned to the AV-8A as VMA-542 was forming. Since our first hop would be solo, we were intensively coached in the aircraft's systems and the use of the throttle and nozzle levers. Our 'simulator' was a throttle quadrant attached to a board! We sat at the table and went through take-off and landing procedures, moving the throttle and nozzle levers appropriately.

"My first two flights were conventional take-offs and landings. A fully fuelled 16,500lb [7,485kg] Harrier had 21,000lb of thrust that came on within 2½sec of slamming the throttle to full power. The acceleration was awe-inspiring, blurring the instrument panel and pushing the jet to take-off speed within four seconds or so. By





LEFT The “office” of the AV-8A was essentially the same as that of the RAF’s Harrier GR.1, as seen here with the seat removed. A Ferranti inertial navigation system (INS) display is mounted directly ahead of the control column and worked in conjunction with the Smiths head-up display (HUD) mounted atop the central instrument panel. The throttle and nozzle levers are located on the cockpit’s port side.

BELOW Two-seat TAV-8As of specialist Harrier training unit VMAT-203 await their next flight at Cherry Point. Established in 1975, VMAT-203 trained all USMC (and Spanish Navy) AV-8A pilots, the last completing the course in March 1985. The unit continues to train AV-8B pilots and maintenance crews. Wearing the unit’s “KD” tailcode, these examples have had toned-down “stars and bars” applied.

the time a Harrier reached the end of a standard 10,000ft [3,050m] USAF runway, it had reached almost 400kt. Another satisfying point about the Harrier was its extremely light and responsive flight controls, completely different from the comparatively heavy stick of the A-4 Skyhawk.”

Known as “The Aces”, VMA-231 transitioned from reserve status to become the third USMC AV-8A squadron, also based at Cherry Point, in October 1973. After working up, VMA-231 embarked 14 Harriers in the aircraft carrier *USS Franklin D. Roosevelt* (CV-42) during 1976–77 for operations alongside two squadrons of F-4 Phantoms, three of Vought A-7 Corsairs and one of Grumman A-6 Intruders. The Harriers flew independently of the normal carrier launch and recovery cycles and could operate in poor weather conditions which halted conventional aircraft operations.

A dedicated TAV-8A-equipped Harrier training unit, VMAT-203 (“The Hawks”), was established at Cherry Point in 1975, since when the unit has

been responsible for the training of all USMC Harrier pilots, as well as those operating the Spanish Navy’s AV-8S Matadors.

The USMC Harrier squadrons shared the task of six-month deployments to Asia to provide support for Marines in the Western Pacific and deployments at sea. The AV-8As proved they could operate from a wide variety of naval vessels, from mammoth aircraft carriers to small amphibious assault ships.

The Sea Control Ship

In the summer of 1971 Adm Elmo Zumwalt ordered the conversion of the *two Jima-class* amphibious assault ship *USS Guam* (LPH-9) into an interim version of his Sea Control Ship concept, intended as an escort vessel to provide air support for convoys. The following year a detachment from VMA-513 operated from the *Guam* to demonstrate the concept. Bud Orr describes the challenges the unit faced:

“Bud Iles was the VMA-513 operations officer





and the Sea Control Ship deck manager. Bud and I designed the landing aids. We had a single cell from a Fresnel lens that was floating in oil and projected out a 3° flightpath with 6° of green, 0.5° of amber and 4° of red. It was pretty antiquated but it worked. I made more than 170 landings on the *Guam*, 65 of them at night. We had six Harriers attached to the ship. We worked off the coast of South Carolina and then we deployed to the North Atlantic.”

The Harrier pilots flew more than 170 sorties in the poor weather conditions of the North Atlantic. Sorties included the interception of Soviet Tupolev Tu-95RTs *Bear-D* and Tu-16 *Badger* reconnaissance aircraft. The Flying Nightmares deployed again to the same ship on a six-month Mediterranean tour in 1976.

Marine Harrier pilots also refined the art of vectoring the AV-8A's engine nozzles in forward flight (“VIFFing”), to enhance the aircraft's defensive capabilities. During operational readiness training, pilots from VMA-513 and the other

ABOVE *Tigers at sea — AV-8As of VMA-542 operate from the two Jima-class amphibious assault ship USS Guam (LPH-9) during trials of the Sea Control Ship concept in the mid-1970s. Note the fixed inflight-refuelling probe fitted for long-range operations.*

squadrons developed air combat techniques flying against F-4J Phantoms, USAF Northrop T-38 Talons and North American F-86 Sabres, simulating potential threats such as the Soviet MiG-21 and MiG-17.

Former VMA-213 Harrier pilot Lt-Gen Harry Blot, instrumental in developing the technique for the USMC, describes how the Marines made VIFFing a central part of their training:

“One of the thoughts we had was that the enemy had developed the capability to knock out runways, and at some point in the battle, the Harrier might be the only aircraft capable of flying. Therefore we wanted to be able to perform the air-to-air mission as well. The Brits used thrust-vectoring right from the beginning, but they were using it as a last-ditch manoeuvre.

One of the fourth batch of AV-8As to be delivered, BuNo 159239 made its first flight on April 11, 1974, and operated with VMA-231; note the “Ace of Spades” motif on the nose. It was retired in 1986 and is currently on display at the San Diego Air & Space Museum.

Artwork by JUANITA FRANZI / AERO ILLUSTRATIONS © 2015





ABOVE AV-8A BuNo 159232 of VMA-231 aboard the Tarawa-class amphibious assault ship USS Saipan (LHA-2) in Norway during Exercise Teamwork 80 in August 1980. The unit embarked in USS Iwo Jima for its return voyage, stopping off at Yeovilton to cross-train with Royal Navy Sea Harriers before arriving in the USA in November 1980.

We decided to evaluate this new capability to see if it was valuable in the air-to-air arena. We flew hundreds of sorties against different types of aircraft in conjunction with VX-4, the operational test organisation, to determine what the best tactics were and the best possible way of using thrust-vectoring."

The Harrier Carrier

By the late 1970s all four Harrier units (three attack squadrons — VMA-513, VMA-542, VMA-231 — and VMAT-203, the training squadron), were operating from Cherry Point, with VMA-513 moving to Yuma, Arizona, in 1983.

During the first ten years of operational service (1971–81) the AV-8A force suffered the highest loss rate for a fighter aircraft in naval aviation. The type was challenging to fly, especially in the V/STOL regime, and a Harrier pilot had to follow strict procedures and assiduously maintain his skills and proficiency. The USMC modified its training programme for the Harrier, tightening entry requirements and expanding the number of training sorties. Using the two-seat TAV-8A significantly lowered the Harrier loss rate.

During 1979–84 the USMC worked with McDonnell Douglas to upgrade the 60 surviving AV-8As to AV-8C configuration, which would enhance the type's tactical capability and improve support. The "C" modification added lift-improvement devices for improved VTOL performance, life-extension modifications and

the fitting of electronic countermeasures (ECM) equipment and an inertial navigation system.

Further proof of the AV-8A's versatility came with an unscheduled deployment aboard the Tarawa-class amphibious assault ship USS Nassau (LHA-4) in early 1981. Until this deployment the Harrier was perceived by the American military as a Marine Corps-only close-air-support aircraft. The deployment of the AV-8A on a "Harrier Carrier" to fill a gap in the national defence posture of the USA afforded the V/STOL Harrier a venue to demonstrate its unique flexibility.

Lieutenant-Colonel W.R. Spicer, Commanding Officer of VMA-231 during May 1980–August

USMC AV-8A serials



AS PER THE usual American process, the USMC's AV-8A procurement was spread over several fiscal year (FY) defence budgets. A total of 102 AV-8As and eight TAV-8As was delivered, plans to acquire a further four single-seaters having been amended to accommodate the extra cost of the TAV-8As.

FY	Quantity	Type	Serials (BuNo)
1970	12	AV-8A	158384–158395
1971	18	AV-8A	158694–158711
1972	30	AV-8A	158948–158977
1973	30	AV-8A	159230–159259
1974	12	AV-8A	159366–159377
1974	8	TAV-8A	159378–159385

1981, explains the concept of this innovation:

"The genesis for the Harrier Carrier was an agreement between America and its allies which required the USA to keep two carriers [CVAs] in the Mediterranean at all times. In early 1981 this was not being done; the Navy had one carrier in the Med and one in the Indian Ocean. Our allies insisted that we honour our commitment, but a CVA was not available to fulfil the mission.

"The issue came down the chain of command very quickly, and I received a call from Col B.J. Palmer, Commanding Officer of MAG-32 [Marine Aircraft Group 32]. He wanted to know how quickly VMA-231 could get aboard an LHA and head for the Mediterranean. My squadron had only just got back from a shipboard deployment to Operation *Arctic Express* for 90 days, and I told him 48hr or as soon as the deck was available. Palmer told me he had recalled VMA-542 from a deployment at Twentynine Palms [in California], and that it would be back within 24hr.

"Palmer, Lt-Col Drax Williams and I flew to Norfolk, Virginia, for a meeting with the Deputy Commanding General of the Fleet Marine Force, Atlantic (FMFLANT), Maj-Gen Hal Vincent, who told us that we had no restrictions, to use our imagination and to make this work. He told me specifically that as VMA-231 had the most recent ship experience, to take the lead on making the flightdeck work like a big deck carrier or better.

"The *Nassau* was available, so a period of FCLP [field carrier landing practice] and carquals [carrier qualifications] was organised quickly, and we loaded aboard with 20 aircraft. The transit to the Mediterranean was to be our work-up, with the expectation to be fully ready for any mission upon entering the Med.

"By the time we entered the Med we could launch eight aircraft in about 100sec and recover eight aircraft in a little over two minutes, with near simultaneous landings at Spots 2, 4, 6, and

7. As soon as a flight landed it immediately commenced taxiing to a parking position while the next launch was taxiing into position for take-off. Only the flexibility of the Harrier could have allowed this, and the Captain was very impressed by the flexibility this allowed him in driving the ship.

"The Harrier Carrier proved so useful that we spent 103 consecutive days at sea operating; but it was worth it because it proved the perfect showcase for the Harrier. It clearly demonstrated the incredible flexibility of the aircraft, not only to the Navy, but our allies as well. I believe this deployment was a major stepping-stone for the Marine Corps; the Harrier helped the V/STOL cause and greatly enhanced investment for advanced capability in future variants of the Harrier like the AV-8B."

Proof positive

In 15 years of operation the AV-8A proved not only that V/STOL aircraft could meet the close-air-support requirements of the Marine Corps but also that the concept of V/STOL operations was practical. Former Harrier pilot, MAG-13 CO and Vice-Commander, Naval Air Systems Command, Maj-Gen Joe Anderson concludes:

"To my mind the AV-8A Harrier was like the helicopter in Korea. The latter could only carry two fully-loaded combat Marines; when you look at that today, you would say that was not significant in terms of combat projection. Well, it was in terms of evolution! The AV-8A was necessary to take a major power like the USA and a service like the Marine Corps and make the latter a centrepiece of operations. The Harrier had limited capability, but that's how the first generation automobile, boat and other major systems evolved . . . the AV-8A brought the USMC into the world of flexible basing and the concept of vertical development."



The legacy — a McDonnell Douglas/Boeing AV-8B Harrier II of VMA-231 leaps off the deck of amphibious assault ship USS Kearsarge (LHD-3) somewhere in the Atlantic in October 2014. The Harrier has played a major role in all USMC combat operations since its entry into service in 1971 and continues to be a vital asset for the US Marine Corps.

MC2 TAMARA VAUGHAN / US NAVY



THE POLKA DOT RIDGE- RUNNERS

THE 45TH TRS
IN KOREA

Lauded as one of the finest pure fighters of the Second World War, the North American P-51 Mustang also found a niche as a valuable tactical reconnaissance aircraft. When the redesignated F-51, by then approaching obsolescence, was recalled to reprise the perilous low-level “Tac-R” role in Korea, lack of pilot experience and the type’s acute vulnerability led to brutally high losses, as **DOUG GORDON** explains

THE NORTH AMERICAN RF-51D was developed from the most prolific and successful of all the Mustang variants, the P-51D. Originally designated the F-6D, the reconnaissance version of the thoroughbred fighter first entered service with the US Army Air Forces in 1944 and saw plenty of action during the last year of World War Two. The F-6D could carry two cameras, a K.17 and a K.22, in the rear fuselage. One was placed in a horizontal position and one in a vertical oblique position. The aircraft retained the six 0.50in-calibre machine-guns of the fighter variants.

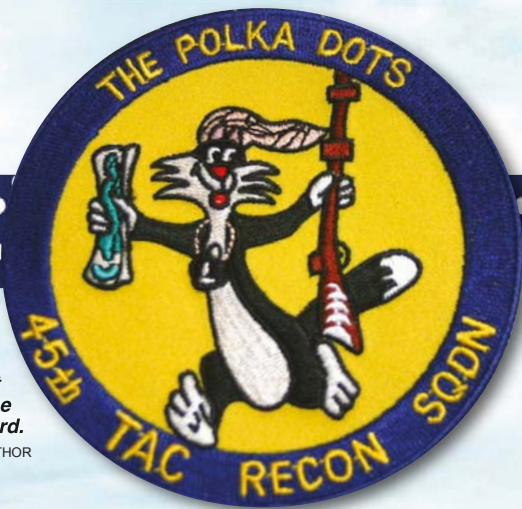
Following the end of the war F-6Ds served with tactical reconnaissance (Tac-R) units in both the regular air force and the newly-established Air National Guard. The type was redesignated RF-51D during changes made in 1948 following the establishment of the USAF as an independent military arm the previous year. In June 1950 North Korean communist forces pushed across the 38th Parallel into American-supported South Korea, marking the start of a three-year conflict.

Back in the USA, factory-fresh Mustangs, which had been held in storage since 1945, were prepared for service and assigned to USAF units, notably the 45th Tactical Reconnaissance Squadron (TRS), which was reactivated at Komaki, near Nagoya on the Japanese home island of Honshu, in September 1950. The unit



MAIN PICTURE North American RF-51D 44-84775 of the 45th Tactical Reconnaissance Squadron (TRS), seen here at Kimpo, sports the unit's distinctive polka-dot spinner. Despite suffering an accident on May 18, 1952, this aircraft was eventually returned to the USA, where it served with the 105th TRS as part of the Tennessee Air National Guard.

DAVE MENARD COLLECTION VIA AUTHOR





ABOVE Bearing the name Linda and Bobby Jr on the engine cowling, F-51D 45-11613 is seen here in a line of Mustangs at K-14 Kimpo in 1951. On strength with the 45th TRS, this machine was written off during an accident at Itazuke airbase in Japan on November 2 that year. Note the Douglas RB-26s of the 12th TRS in the background.

was part of the 543rd Support Group (SG), which also included the Lockheed RF-80 jets of the 8th TRS, and which had its headquarters at Taegu, designated K-2, in South Korea.

INTO THEATRE

The Mustangs of the 45th TRS — known as “The Polka Dots” — did not arrive until late December 1950. Clyde East, a World War Two Mustang ace, was Operations Officer for the 45th, having transferred from the 8th TRS, with which he had completed 60 RF-80A combat missions over North Korea. Following a period of intensive training the 45th was ordered to Taegu, where it arrived on December 28. East recalls:

“I flew the [45th’s] first combat mission on December 29, with Lt Bob Sweet as my wingman. Bob was one of our pilots with no previous Mustang time; but he had flown more than 100 missions as a [North American T-6] ‘Mosquito’ pilot and knew the Pusan Perimeter like nobody else. Although the 45th was seldom assigned missions in the Army front area [although the Mosquitoes were still in operation], it was a big help to have someone of Bob’s experience to give us an insight into operating with the ground forces”. (The Mosquitoes was the name adopted by the 6147th TAC Control Squadron, which had been flying T-6s on forward air control operations out of Taegu since August 1950.)

The main mission of the RF-51D in Korea was visual reconnaissance, the cameras being used as a means of confirming a visual report. The prop-

driven Mustang had a distinct advantage over its jet contemporaries by being able to stay airborne for a long time, but it also had a marked drawback in that it was powered by a liquid-cooled piston engine which was extremely vulnerable to groundfire. A small hole in the cooling system could disable the aircraft.

February 1951 was a significant month for the Polka Dots. On the 25th, the 67th Tactical Reconnaissance Wing (TRW) was activated and took over the assets of the 543rd SG at K-2. The 8th TRS was redesignated to become the 15th TRS and the 67th also incorporated the Douglas RB-26 Invaders of the 12th TRS. The same month the Wing came under the command of Col Karl L. Polifka, a World War Two veteran reconnaissance pilot who had served with distinction in the Far East and European theatres. He had commanded the 8th Photographic Reconnaissance Squadron (PRS) in the south-west Pacific, flying photo-recce Lockheed P-38 Lightnings, and was considered by most Tac-R pilots to be an outstanding pilot and tactician — as well as the most respected voice in USAF reconnaissance. Clyde East was pleased to see Polifka in command:

“Polifka was a very aggressive commander and spent much of his time at Fifth Air Force HQ in downtown Taegu, promoting things for his Wing and tutoring the 5th’s Operations Section and senior staff officers on how Tac-R should be employed. He was disturbed by the heavy losses of the 45th TRS. He suggested tactics that probably reduced casualties and triple-A [anti-



ABOVE LEFT Lieutenant Bob Sweet on the wing of a Mustang in Korea. Sweet went on to fly Lockheed RF-80s, Republic RF-84Fs, McDonnell RF-101 Voodoos and McDonnell Douglas F-4 Phantoms for the USAF. **ABOVE RIGHT** Colonel Karl Lewis Polifka, CO of the 67th TRW in Korea, in the cockpit of a Lockheed P-38 during World War Two.

aircraft artillery] damage somewhat; but the assignment of additional Mustangs to the 45th, and the increased sorties resulting, still gave the unit what was probably the highest loss and damage rate in the Fifth Air Force."

The 45th TRS suffered disproportionately heavy losses, as Bob Sweet explains:

"By June [1951] Lts Summerlin, Dolan and Thatcher and Capts Brown and McCollum had been lost. Lieutenant Rice had been shot up, baled out between the lines and was fortunate to be picked up by US Army troops. He had struck the tail and broke a leg. Rice always flew armed to the teeth as he had done as a 'Mosquito'

pilot. It didn't do him much good this time as he ended up on the ground with the stock broken on his Thompson sub-machine-gun and with his handgun missing.

"The 45th pilots felt that they were taking the vast majority of battle damage and aircrew losses. The number of missions to complete a tour were the same as for the 8th TRS. Given that the RF-51Ds operated at low altitude for hours at a time, rather than the shorter sorties of the jets, it is not hard to understand why losses were high."

There was a variety of circumstances accounting for the loss of so many young pilots. While flying an F-51D 1st Lt Marshall J. Summerlin experienced

The 45th TRS was the only unit to operate the RF-51D during the Korean conflict, the variant being fitted with camera ports in the rear fuselage, as seen here on RF-51D 44-84840, Sweet Lorraine. On a mission on July 7, 1951, the aircraft was hit by ground fire; pilot 1st Lt Frank Ward baled out and the aircraft crashed and exploded near Yongson-ni.

BOARDMAN C. REED VIA WARREN THOMPSON





ABOVE With the 45th TRS's trademark polka-dots on the spinner and tips of the wings and tailplane (and, unusually, with the tailwheel down in flight), RF-51D 44-14547 Symons Lemon pushes up close for a photograph during a mission. Note the direction-finding loop fitted to the RF-51D aft of the mast aerial on the rear fuselage.

engine failure and crashed. Lieutenant Dolan's RF-51D crashed in bad weather on March 19, 1951. On April 10, Capt John J. McCollum crashed while on a night reconnaissance mission in an RF-51D. Roma C. Foglesong's F-51D fell prey to anti-aircraft fire on April 14 and three days later Capt Charles J. Brown's F-51D was hit by groundfire and crashed while on a mission.

NO SUBSTITUTE FOR EXPERIENCE

One of the most serious problems facing the 45th TRS, and one which undoubtedly contributed to the unit's high loss rate, was the shortage of experienced pilots, as Clyde East relates:

"On activation of the 45th we were assigned several pilots who had been recalled [to active service], but who had never flown a fighter aircraft and had little or no flying time to speak of since '45-'46. These assignments continued after we arrived in Korea. We were assigned a T-6 sometime in February, after impassioned

pleas to Wing. This allowed us to run a checkout programme in addition to our daily mission schedule. As we had no two-seat '51s for checkout we had to assign a chase plane to assist and instruct. Of course, it was not easy to get two Mustangs available for these checkouts, as we always had a heavy combat commitment.

"The 15th was not as strapped as we were as there was an RF-80 recce school at Shaw AFB in South Carolina turning out almost enough pilots to satisfy their requirements. The RB-26 [units] also had a school, at Langley AFB in Virginia, which later moved to Shaw. With the 45th, inexperience was a constant problem from its activation forward."

In a review of pilot competence and experience held in the early summer of 1951 it was revealed that seven of the newly assigned aircrew were recalled reserve pilots, many of whom had not flown for five years. Two of the pilots had no experience in the particular aircraft type they were

RF-51D 44-11913 operated with the polka-dot markings of the 45th TRS, and was named Tulie, Scotty & ?; the wife of the pilot who named the aircraft was pregnant when he left for Korea, but he was killed in another aircraft before the unnamed child was born. The unit retained the Mustang's name in his honour.

Artwork by JUANITA FRANZI / AERO ILLUSTRATIONS © 2015





ABOVE An RF-51D is serviced on the busy flightline at K-14 Kimpo in November 1951. The variant was equipped with an AN/AMQ-1A wire recorder which enabled the pilot to voice-record what he saw, to be played back on his return to base. **BELOW** One of the patches of the 45th TRS, which illustrates the unit's armed reconnaissance role.

to fly, and no combat experience whatsoever. The 67th TRW was not impressed. The Wing requested that, in future, all assigned pilots should have at least nine months' transition training in the USA before being posted to combat units. It was not the job of tactical squadrons at war to run a transition school.

Despite the many problems facing the Wing, it had to be business as usual for the 45th. Bob Sweet recalls the missions out of Taegu:

"Except for a few special missions we flew singly. Since the fighters had no cameras we were unable to get photographic confirmation of significant sightings, but the air force was willing to live with that and rely on visual sightings alone. They regularly increased the number of sorties scheduled until it was impossible to fly them all. Of course we began to experience losses and, being alone, there was usually no way to determine how or where the loss occurred.

Pleas to Wing were in vain, as we were flooding the system with loads of good information and the Army was as pleased as they could be with the work of the 45th! We also coordinated fighter-bomber strikes on many of the targets sighted, sometimes within minutes of discovery."

"CIRCLE 10"

The pilots of the 45th TRS developed a system for more efficient visual recce, known as "Circle 10". The pilot would fly a 10km (six-mile)-radius

circle around an area where the RB-26s of the 12th TRS had identified enemy ground activity the night before. Each 45th TRS pilot was assigned a specific area with which he was required to be very familiar. He would fly around this area looking out for anything which was different from the day before or which was out of place. If anything was found, the RF-51Ds would call in the fighter-bombers to attack the hidden trucks or armour.



In April 1951 the 45th TRS initiated two-aircraft recce flights. A pair of Mustangs would proceed to the target area; one would fly top cover at 3,000ft (900m) looking out for anti-aircraft fire and incoming enemy aircraft while the other, at 300ft (90m), performed the required reconnaissance duties.

On July 1, 1951, the 67th TRW was dealt a devastating blow. Karl Polifka took off from Taegu in F-51D serial number 44-74638 of the 45th TRS on a visual-reconnaissance mission in the Kaesong area, just south of the 38th Parallel. It was an area known to contain a heavy concentration of anti-aircraft artillery. He descended to take a closer look at some enemy ground activity and in the process his aircraft was hit in the coolant system by small-arms fire and spun out of control. He managed to exit the aircraft, but his parachute snagged on the tail and he went down with it. His body was recovered the next day. In the face of considerable opposition from his officers and staff he had wanted to



ABOVE A 45th TRS pilot walks out to RF-51D 44-84778 My Mimi as the Mustang is prepared for another adrenalin-fuelled low-level sortie over enemy territory. The 45th operated more F-51Ds than RF-51Ds, the former being tasked with strafing targets of opportunity as well as recce duties. Note the polka-dot helmet on the Mustang's wing.

see for himself what the pilots of the 45th TRS faced every day. The loss to the 67th TRW was profound; tactical reconnaissance had lost one of its staunchest advocates.

On August 21, 1951, the 45th TRS, together with the other units of the 67th TRW, moved to K-14 at Kimpo. The base was completely ill-prepared for the Wing's arrival. Parking areas were overcrowded. The runway, only 5,000ft (1,520m) long, was in bad need of repair and the overruns were alarmingly short. When the base had been evacuated in the face of the North Korean advance, the concrete runway had been cratered to prevent its use by the enemy. When the area

around Seoul had been reclaimed, hasty repairs had been made, filling the craters and covering them over with tarmac. On a hot August day a fully loaded aircraft could be felt dragging as it hit the softer repaired areas.

The move to K-14 put the 67th TRW much nearer to the action than it had hitherto been. This was grimly illustrated by the toll levied on aircraft and pilots in the days following arrival. One RF-51D was destroyed by enemy action, one RF-80 was damaged by a MiG-15 and an RB-26 limped home from a mission with wounded crew members after a mauling by flak. In September enemy activity in MiG Alley increased markedly.

Wearing the buzz number FF-914 — standard F-51Ds were designated "FF", the photo-recce RF-51Ds "RF" — Mustang Ana M gets under way at Tsuki in Japan, where all regular major maintenance work for the 45th's aircraft was undertaken. This aircraft was given two names, the port side being marked as Susan Mk II.

ED STOLTZ VIA AUTHOR





ABOVE In early 1953 the Polka Dots swapped their Mustangs for Lockheed RF-80s, an occasion that demanded a photo-call, with RF-51D Wind Wraith being posed nose-to-nose with an RF-80 at Kimpo on January 1, 1953.
BELOW RIGHT The ungainly underwing store used during Project Camera Pod in an attempt to upgrade F-51Ds.

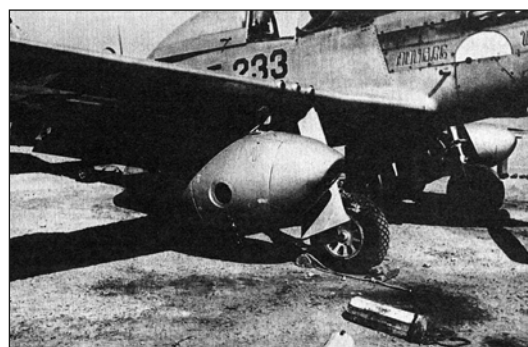
Not only was China pouring MiG-15s into North Korea, bases to hold them were also rapidly being built. It was one of the primary missions of the 67th TRW to keep an eye on this construction and provide regular updates to the Fifth Air Force.

JET REPLACES PROP


Necessity is the mother of invention, and throughout the conflict in Korea the 67th TRW was involved in a number of special projects. All were initiated with the sole purpose of enhancing the war effort and developing strategies for increasing efficiency and ensuring ultimate victory.

One such was *Camera Pod*, which consisted of the installation of external camera pods on the 45th's F-51Ds to upgrade them to RF-51D standard. The project was abandoned when it became apparent that it was unsafe. The aircraft were less manoeuvrable, slower by some 30 m.p.h. (50km/h) and pilot fatigue was markedly increased. These factors merely served to increase the Mustang's vulnerability to groundfire.

The failure of *Camera Pod* and its subsequent abandonment hastened the withdrawal from active service of all the 45th TRS F-51Ds and their replacement, by the end of 1951, with RF-51Ds, of which 21 were assigned. The addition of the RF-51Ds gave the squadron a greatly enhanced photographic capability, which, together with the RF-80 sorties of the 15th TRS, increased the volume of material available to the fighter-bomber units. What was really required, however, was the upgrading of the squadron to jet equipment at the earliest opportunity. Plans were put in hand



in early 1952 to convert the Polka Dots to RF-80s, RF-80Cs and F-80Cs.

On February 17, 1953, the 45th TRS relinquished its last RF-51D to become an all-jet squadron. More than half a century later, at a "Recce Reunion" in Las Vegas in 2006, Clyde East remembered: "I flew a tour as an RF-80 flight commander before being transferred to the RF-51D-equipped 45th TRS as Operations Officer. I completed a second tour as a 'retread' Mustang pilot flying close recce support. Owing to the heavy groundfire and our low altitude, it was the toughest and most dangerous combat I had experienced in two wars. During the winter of 1950-51, the 45th experienced the highest casualty rate of any squadron in the Fifth Air Force". It was a fitting tribute to the Polka Dots from a former warrior who had flown Spitfires and Mustangs in World War Two and survived some of the most challenging missions of the Cold War. 

H SECTIONS
51. B.
51. C.
51. F.

A5/4557

NEUPORT SCOUT

SOPWITH CAMEL

NEUPORT SCOUT

SOPWITH 80HP

SOPWITH CAMEL

SEC





ANYONE WHO remembers the old Service song *The Quartermaster's Stores* will find it particularly appropriate for this extraordinary collection of images, which is why we have created a new verse as a title. They come from an album that once belonged to No 138520 George Thomas Wright (seen at **RIGHT**), who, having been a chauffeur and gardener in civil life, enlisted on May 19, 1916, and served in the Army Service Corps, the Training Reserve Battalion and the Essex Regiment before transferring to the Royal Flying Corps (RFC) as an AC2 air mechanic on December 12, 1917.

By the time he was demobilised in January 1919 the Service had become the RAF and Wright was in Egypt, having gone there with the RFC/RAF Egyptian Expeditionary Force. He was serving with X Aircraft Depot (XAD), which had been formed on July 26, 1916, from the Port Depot, Alexandria, at Aboukir, and was to be redesignated Stores Depot, Aboukir, in April 1920. The Depot, along with X Aircraft Park, was part of the RFC and Australian Flying



OPENING PAGES *An Aladdin's cave of racks containing fins, rudders, elevators and ailerons for a variety of aircraft, including the Nieuport Scout, Royal Aircraft Factory S.E.5a, Sopwith F.1 Camel, Airco (de Havilland) D.H.6, Bristol M.1C monoplane and Bristol Scout.*

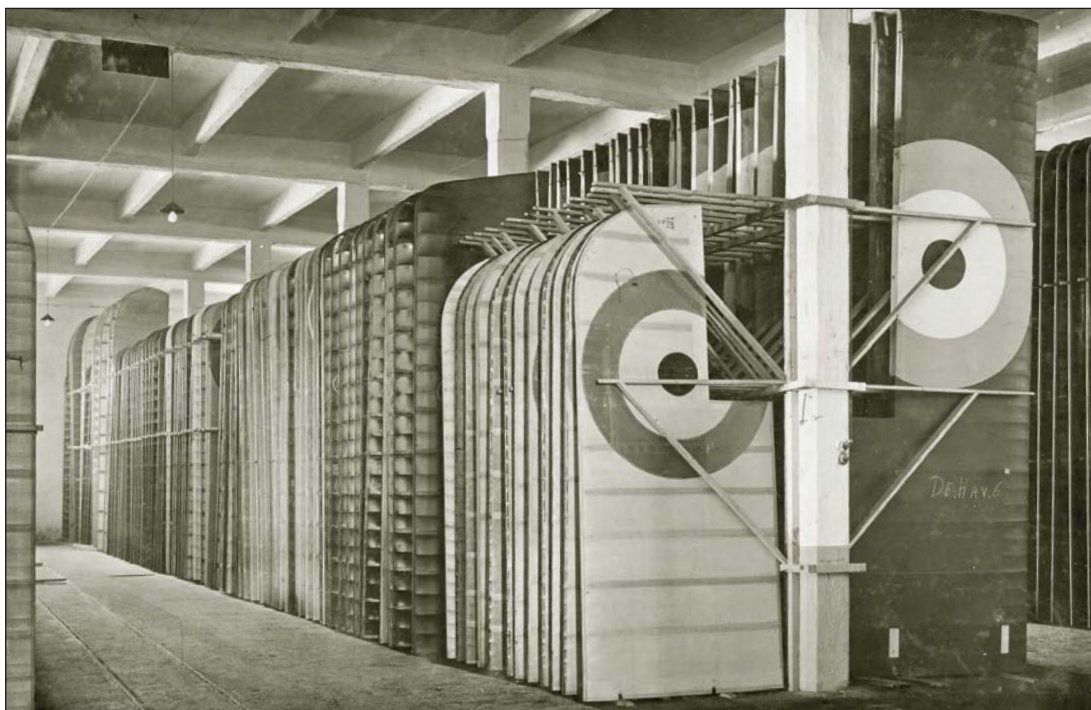
BELOW *A wing panel with "XAD" chalked on its tip is brought out of Building No 4 of the depot at Aboukir to be loaded on to one of the Motor Transport Section's solid-tired Leyland lorries, L 2223.*

Corps establishment within the Middle East Brigade, XAD being established for major engine repairs and the allocation of stores, and the Park for the allocation of aircraft and major repairs to them. George left the Service a few months later, in mid-1919, after returning to England.

These professionally-taken pictures, just a selection of those in the album, serve to remind us that pilots and groundcrew serving overseas relied on a large support staff and vast stocks of materials to keep them and their aeroplanes operational. They also show the manner in which the stores were maintained, the workshops, and some of the aircraft and engine types for which parts were held in the depot.

Text continues on page 70





ABOVE A model of order: wing panels are neatly stacked on their roots. The panel on the right is marked "DE. HAV.6" and is for the angular trainer biplane whose square-cut wings were said to be "made by the mile and cut off by the yard", while the smaller panel beside it bears the stencilled marking "SI 5123 AMA" at its top end.



ABOVE Large and small components for rotary engines including the 80 h.p. and 100 h.p. Clergets. Crankcases are stacked on top of the cupboards, and the clerk's desk in the foreground has been brightened up with a couple of scenic postcards; perhaps some of the more "exotic" examples were removed for the photographer's visit . . .



ABOVE From the left, this area comprises racks of metal airframe fittings; cupboards full of aircraft instruments, with a crate of bomb carriers in front; parts for bomb carriers for Bristol Fighters, Royal Aircraft Factory R.E.8s, Armstrong Whitworth F.K.8s and D.H.9s; and cans of various dopes, including RAFTITE No 2 "FOR HOT CLIMATES".



ABOVE Fitters hard at work in the engine installation bays at X Aircraft Park. From right to left, the aircraft include an Airco D.H.9 (awaiting its engine), a Nieuport Scout, an S.E.5a, another D.H.9 and a Sopwith F.1 Camel. The Egyptian Expeditionary Force had been formed in March 1916 under the command of General Archibald Murray.



This delightfully detailed photograph shows tools for the airframe and engine mechanics, including frame saws, compass saws, drill braces, twist bits, assorted hammers, vices, drills, planes, files, ratchets and cramps.

Text continued from page 66

Other photographs depict the facilities for assembling and testing machines at X Aircraft Park, based successively at Heliopolis, Abbassia in Cairo and Kantara (or Qantara). From April 1920, after George Wright's departure, there was also X Engine Repair Depot at Abbassia. Some of the accompanying photographs were probably taken at the former of these two locations.

FIGHTING SUNLIGHT

Nor was this all that went on at XAD. Before August 1914 the National Physical Laboratory (NPL) had made arrangements with the Admiralty to expose a number of different types of rubberised balloon fabric to the climate in Somaliland to gain information regarding the nature and extent of protection required for the use of balloons in tropical countries. The results obtained at the end of 1916 proved of considerable use when it became necessary to employ kite balloons for observation in Egypt and Palestine and scouting airships in the Eastern Mediterranean. In addition, at XAD a former member of the NPL staff, Dr

(subsequently Major) Atkins, using experience gained while working at the NPL in England, superintended the experimental exposure and examination of used fabric of several new types. It was established that deterioration was due almost entirely to the "actinic radiation of sunlight", and that considerable protection could be afforded either by dyeing the rubber by the use of a thick rubber layer containing litharge, or by dyeing or "spreading" with aluminium powder the outer cotton ply.

Similar experiments were made on the deterioration of aeroplane fabric, the use of an opaque coating being found to make the deterioration caused by the actinic action of sunlight on the linen almost negligible. It was reported that: "The use of the nitro-cellulose varnish P.C.10 devised by the Royal Aircraft Establishment and of oil varnishes of similar colour has undoubtedly saved thousands of wings from having to be stripped and recovered". It was then found that suitable protective dyes could be incorporated in the dope itself, and that the use of pigmented dope also helped to maintain tautness.



Aircraft are prepared for flight testing at X Aircraft Park. They are, from left to right, a Bristol F.2B Fighter, an S.E.5a, a Nieuport 17 and a D.H.9. A Royal Aircraft Factory B.E.2e is also visible on the threshold of the Bessonneau tent hangar. The white circles in the foreground delineate a compass base for swinging the compasses of the aircraft.





ABOVE The fabric shop, with wing panels being covered (or re-covered) in the foreground. Visible in the background on the right are a D.H.9, an S.E.5a and a Nieuport. The second wing panel along is a port upper wing panel for either a B.E.2e or R.E.8; its inverted-vee bracing struts for the upper-wing extension are seen here being fitted.





Mirage IIIO(A) A3-54 of No 77 Sqn RAAF (nearest camera) formates with A-4 Skyhawk NZ6205 of No 75 Sqn RNZAF (leading) and an F-16 of the 8th Tactical Fighter Wing over New Zealand during Exercise Triad 84, held the year before the Mirage became the mount of "Crunge".

RNZAF PHOTOGRAPH

“GET CRUNGE!”

JUANITA FRANZI continues her regular series, in which she takes a detailed look at some lesser-known airframes and their markings, with the Mirage III of “AVM Hannibal Crunge”

WHEN THE FLIGHT Leader of “Orange Force”, Flt Lt Bob “V8” Veneziani RAAF, saw his allocated aircraft on the Ohakea flightline, he knew there was mischief afoot. It was the last mission of the joint Royal Australian Air Force (RAAF)/Royal New Zealand Air Force (RNZAF) Exercise *Willoh* 85-1, and Dassault Mirage IIIO(A) A3-54 had been specially adorned in yellow distemper.

Joint exercises were frequent events for RAAF fighter squadrons. Although they were officially used to sharpen skills and gain experience, there was also naturally a lively social element. Exercise *Willoh* was inaugurated in July 1979, and became a biannual event involving No 77 Sqn RAAF and No 75 Sqn RNZAF, with the location alternating between an RAAF Base, usually Williamtown in New South Wales, and RNZAF Base Ohakea on New Zealand’s North Island. Its specific purpose was to practise deployment and dissimilar air combat, as well as provide experience in an unfamiliar environment.

Willoh 85-1 was held in New Zealand in February 1985, attended by eight Mirages of No 77 Sqn. Mission profiles included escorting or attacking BAC Strikemaster “bombers” of No 14 Sqn RNZAF and photo-reconnaissance and navigation exercises. The Mirages usually operated in flights of two or four aircraft. A mission might see the flight supporting the Douglas A-4 Skyhawks of their RNZAF counterparts or flying an attack role.


Early in the exercise the Skyhawk pilots felt disadvantaged during air combat because they found it difficult to distinguish attacking and “friendly” Mirages. To improve the situation a flight of Mirages was allocated to the opposing “Orange” Force and

temporary identification markings were applied in yellow water-based paint. The leader of “Orange Force” became “Air Vice-Marshal Hannibal Crunge”.

Unlike large exercises, in which units had defined roles and crews could adopt specific personae to match, *Willoh* worked on a more flexible arrangement. The pilot’s role was allocated at each mission briefing. Likewise, a pilot did not have a specific aircraft; these would be allocated at the briefing or on arrival at the flightline.

On February 14, 1985, the exercise’s final day, Bob “V8” Veneziani found himself in the role of AVM Crunge. He was a recent graduate of the No 2 OCU Fighter Combat Instructor’s Course, and this was his seventh mission of the exercise. He was leading a flight of four Mirages against four A-4s of 75 Sqn on a DACT (dissimilar air combat tactics) sortie.

The colourful markings on A3-54 gave merit to the rumour that a case of champagne was on offer to the pilot who “shot down” Crunge. These sorties were flown in a designated area off the coast, to minimise damage from sonic booms. As the Mirages were flying with limited ground-radar support and the Skyhawks could out-turn them, the tactic used by No 77 Sqn was to fly large arcs in an attempt to be outside the Skyhawk’s visual range. As a former RNZAF pilot recalls: “A Mirage coming head on, ‘needle-nosing’, was almost invisible, so if you lost sight, you were toast”.

Unfortunately there is no detailed account of the dogfight, but the story goes that Crunge’s wingmen turned on him with the promise of a 50/50 split on the prize. After 42min Crunge landed back at base. The winner was a Skyhawk pilot – but there is no record of the ultimate fate of the champagne! 



DASSAULT MIRAGE IIIO (A) A3-54, NO 77 SQN RAAF, EXERCISE WILLOH 85-1, RNZAF BASE OHAKEA, NEW ZEALAND, FEBRUARY 14, 1985

Dassault Mirage IIIO A3-54 was built by the Government Aircraft Factory as a ground-attack variant and was delivered to the RAAF on July 14, 1967. It went on to serve with No 75 Sqn at RAAF Butterworth in Malaysia during the 1970s and was on strength with No 77 Sqn at RAAF Williamtown by 1984. In July 1986 the unit began phasing out the Mirage in readiness for the introduction of the McDonnell Douglas F/A-18 Hornet, and A3-54 had transferred to No 79 Sqn at Butterworth by 1987. It was used for trials of experimental grey air superiority camouflage schemes. On May 6, 1988, A3-54 was withdrawn from service and placed in storage, before being sold in November 1990 to the Pakistan Air Force, with which it served as 90-554.



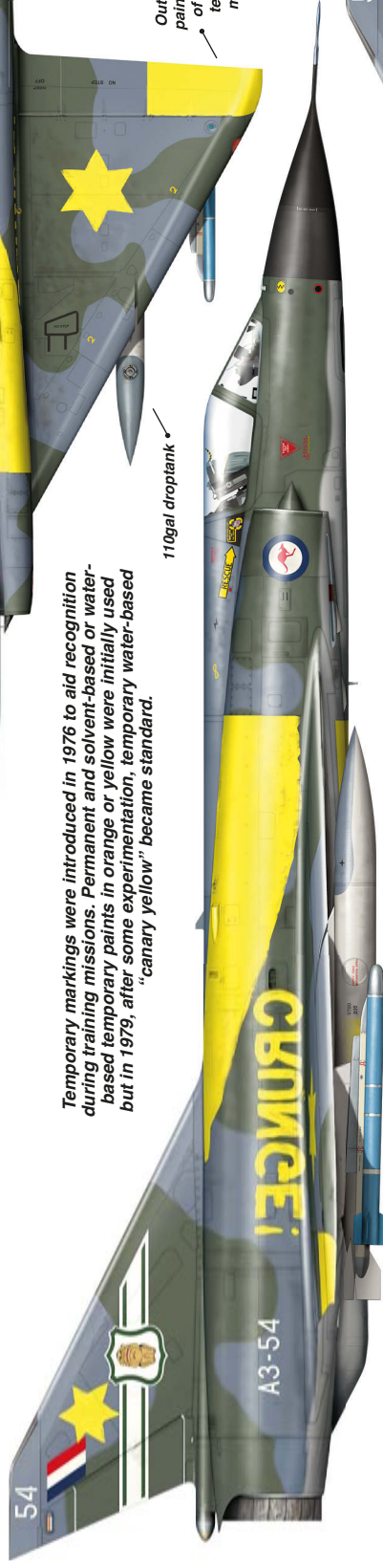
Matra R-550 Magic training round on standard canted launch rail

The stars and "Crunge" legend were non-standard markings

Outer elevons painted as part of standard temporary markings

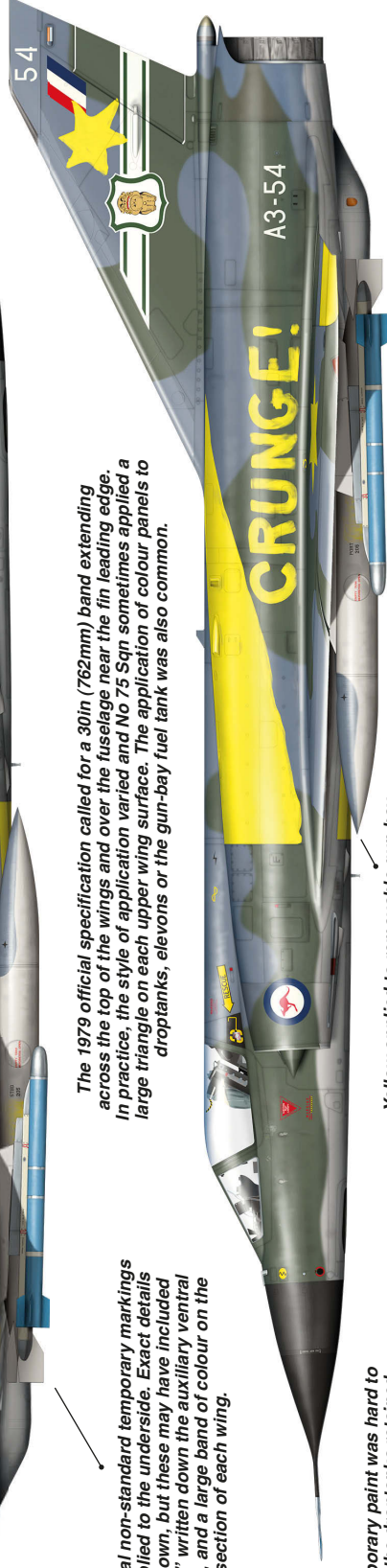
Temporary markings were introduced in 1976 to aid recognition during training missions. Permanent and solvent-based or water-based temporary paints in orange or yellow were initially used but in 1979, after some experimentation, temporary water-based "canary yellow" became standard.

110gal droptank



The 1979 official specification called for a 30in (762mm) band extending across the top of the wings and over the fin leading edge. In practice, the style of application varied and No 75 Sqn sometimes applied a large triangle on each upper wing surface. The application of colour panels to droptanks, elevons or the gun-bay fuel tank was also common.

Additional non-standard temporary markings were applied to the underside. Exact details are unknown, but these may have included "Crunge" written down the auxiliary ventral fuel tank, and a large band of colour on the inboard section of each wing.



The temporary paint was hard to remove: the droptanks retained traces of previous yellow markings.

Yellow applied to removable gun bay fuel tank (standard style temporary marking).

A far-from-pleased Henry Philip Folland (right) at Calshot a few days after the 1929 Schneider Trophy race, on the occasion of A.H. Orlebar setting a new world air speed record of 358 m.p.h. in the Supermarine S.6. Folland's Gloster VI had been withdrawn from the race as a result of chronic problems with the engine supplied by Napier, hence the equally dismal expression of the latter company's representative, Wilkinson, on the left.



Folland's Forgotten Monoplanes



Part 2: Diversification and Disillusionment

In the second article in his three-part series on the little-known 1930s monoplane designs of Henry Folland, often regarded as the ultimate biplane specialist, **RALPH PEGRAM** reveals how Folland was in fact swift to embrace the monoplane, designing a number of single-wing types that, to his dismay, would never get further than the drawing board . . .

AS 1931 DREW to a close the situation at Gloster's factory at Hucclecote was far from sound. The big four-engined TC.33 transport-bomber and TSR.38 torpedo-bomber prototypes were nearing completion, but otherwise the workshops were all but bare and in dire need of production work. Henry Folland and his team strove to address the problem.

Air Ministry Specification F.7/30, the first attempt to try to set out the requirements for the next generation of fighters embracing new technology, had been issued to industry in October 1931 and prompted a great deal of interest, but Gloster's management decided that the company would have to let the opportunity pass; the financial strain of constructing yet another private-venture prototype was simply beyond it. They chose instead to continue development of the SS.19A biplane, whose performance was now looking decidedly promising in comparison with the Hawker Fury and Bristol Bulldog then in service. As the F.7/30 aircraft would take several years to design, construct and test, there was hope that Gloster's fighter may yet receive an order to bridge the gap. It was to be a prescient decision. Folland and his team, however, were working on an advanced monoplane aircraft which they

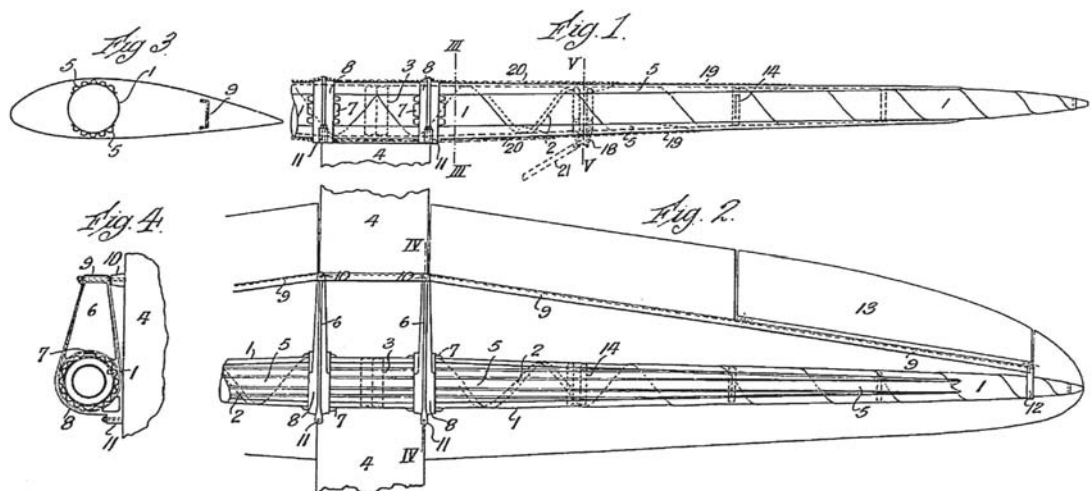
hoped would put them back on the road to success.

Imperial Airways, the government's nominated carrier of air mail, operated a fleet of fairly basic passenger aircraft in the late 1920s, into which the mail was loaded as light freight. As a consequence it was restricted to small loads and travelled at the leisurely pace of the passenger schedules. In order to improve the service it was thought that a fleet of dedicated mailplanes should be acquired to carry the mail throughout the Empire.

THE HIGH-SPEED MAIL CARRIER

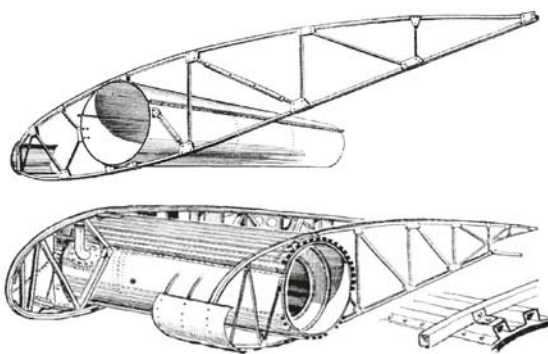
Thus a specification was issued in 1928 requesting designs for an aircraft capable of carrying 1,000lb (455kg) of mail over 1,000 miles (1,600km) at a cruising speed of 150 m.p.h. (240km/h). This was not pursued with much vigour, however, no doubt a casualty of the collapse into financial depression in 1929, and tenders were not received until the end of 1931. In the meantime it appears that the requirement had been modified, as both single- and twin-engined designs were submitted, which is at odds with the original requirement for the aircraft to be able to maintain height at full load in the event of an engine failure. Gloster had chosen the single-engine route.

In 1931 a specification stating exactly the same parameters for load, range and speed as the 1928



ABOVE This patent drawing for Frank Duncanson's innovative mainspar concept shows the structure's tapering cylindrical form. The hollow core (which could double as a fuel tank), made from thin-gauge spiral-wound metal sheet, was reinforced with internal ring formers and a square-corrugated outer sheath.

RIGHT These sketches show (upper) a variation of the spar with the core made of two flanged semi-tubes, and (lower) extra corrugations on the upper part of the spar to take compressive loads in flight. The detail at far right shows how ribs were attached to the spar sheath's top-hat sections via small L-brackets.



mailplane requirement was included in an Air Ministry draft proposal for a high-speed bomber, intended as a replacement for the Hawker Hart light bomber or Boulton Paul Sidstrand medium bomber, or both. The maximum speed of the F.7/30 fighters was to be in excess of 200 m.p.h. (320km/h), with around 250 m.p.h. (400km/h) looking possible, so bombers with a comparable speed were the obvious next step.

The concept for the new bomber consisted of a single-engined aircraft powered by Rolls-Royce's upgraded Buzzard, referred to as the Moderately Supercharged Development and later as the Griffon (not to be confused with the Griffon of the war years). This new engine benefited from some of the technology that had been introduced to create the "R" racing engine used in the Schneider Trophy racers, itself based on the Buzzard, and was to have a power output of around 1,000 h.p. at cruising r.p.m.

Folland selected the Griffon for his High-Speed Mail Carrier, which was to be a cantilever low-wing monoplane with a retractable undercarriage, for which layout drawings were completed in March 1932. Frank Duncanson, Folland's senior team colleague and wing structure and design specialist, had submitted a patent in 1929 for a wing utilising a single tapering cylindrical spar capable of carrying bending and torsion loads,

and suggested that this could be fabricated from a single sheet of metal wound in a spiral, akin to the cardboard tube in a roll of kitchen foil. In 1931 a further patent covered the use of this hollow spar as a fuel tank, the weight of the fuel helping to reduce the bending load at the wing root.

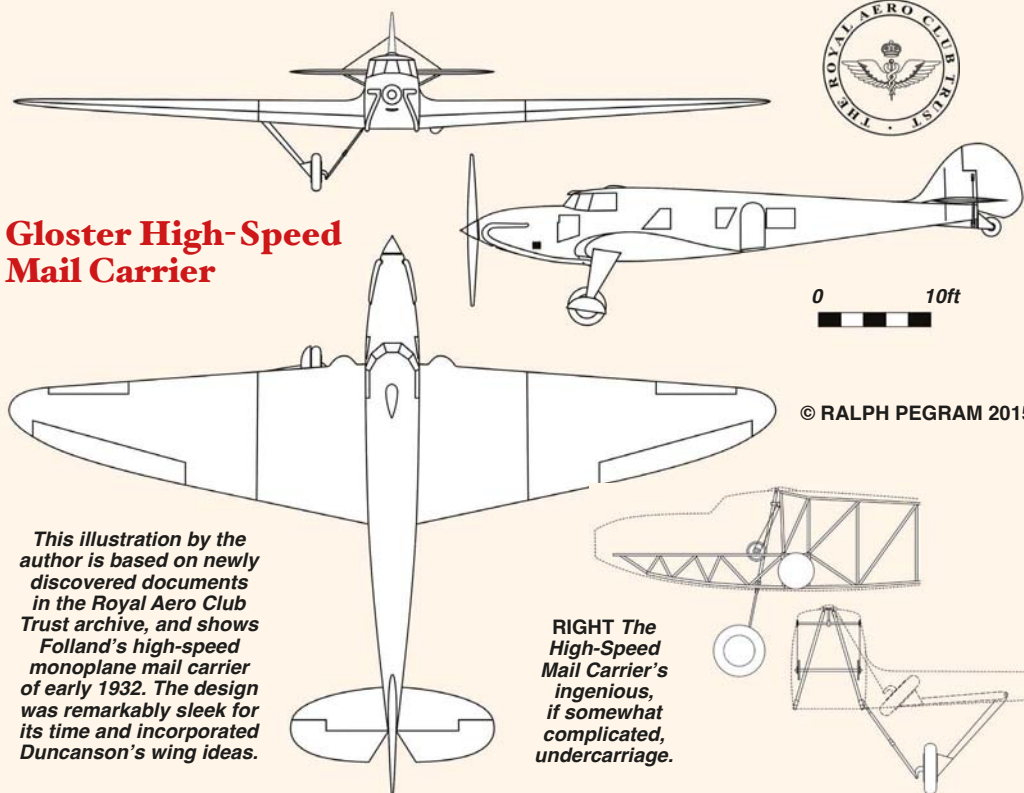
This form of spar construction was selected for the Mail Carrier's wing, the elegant skewed-ellipsoid shape of which is also indicative of Duncanson's input, as he had advocated wing-plans of this form in articles written for *Flight* magazine in 1929 and used one such shape as an illustration in his patent.

THE MAILPLANE IN DETAIL

The fuselage of the Mail Carrier was to be a conventional Gloster steel-frame structure with formers adding slight curvature to the roof and sides. The tailplane was braced by wires to the fin and fuselage. The two-seat cockpit sat just ahead of the wing leading edge. To aid visibility when landing, as the view over the large Griffon engine in the nose was restricted, substantial side windows were positioned on either side of the pilot's feet. A radio operator's station was located in the rear of the cockpit and the mail-stowage compartment, of 92ft³ (2.6m³), was set mid-fuselage and offset to starboard with a gangway to port. The entrance door was just to the rear of

Gloster High-Speed Mail Carrier

This illustration by the author is based on newly discovered documents in the Royal Aero Club Trust archive, and shows Folland's high-speed monoplane mail carrier of early 1932. The design was remarkably sleek for its time and incorporated Duncanson's wing ideas.



the wing trailing edge and there were trapdoors in the floor for dropping mail.

The retractable undercarriage was novel, to say the least. The mainwheel legs pivoted inwards and upwards on hinges positioned some distance outboard on the wing and just ahead of the spars. When extended they sat at an angle of 45° to the vertical. The retraction mechanism comprised twin screwjacks with their upper ends secured within a small aerodynamic blister in the roof of the cockpit just aft of the pilots' seats, and their lower ends fixed to the fuselage floor adjacent to the wing roots. Fixtures at the top of struts connected to the wheel hubs were drawn up the screwjacks to retract the mainwheels, which then rested in shaped housings in the leading-edge wing roots, which left them partially exposed. The system was manually operated. The tailwheel was fixed.

The Rolls-Royce Griffon drove a fixed-pitch two-bladed propeller and the exhaust pipes fed forward before looping down under the nose and exiting beneath the wing. A small air-intake aperture under the nose served to cool the crankcase and feed the supercharger intakes, which were inside the engine cowling; Folland did not wish a repeat of the intake-flow problems experienced with his Gloster VI Schneider racer in 1929. An absence of radiators on the layout

Gloster High-Speed Mail Carrier data

Span	68ft 0in	(20.7m)
Length (overall)	49ft 0in	(14.9m)
Height (overall)	12ft 0in	(3.6m)
Maximum chord	14ft 0in	(4.3m)
Dihedral	2°	
Angle of incidence	3°	
Wing area	600ft ²	(55.7m ²)
Aspect ratio	6.6:1	
Aileron area	2 x 30ft ²	(2 x 2.8m ²)
Tailplane and elevator area (total)	80ft ²	(7.4m ²)
Fin and rudder area (total)	35ft ²	(3.2m ²)
Wheel track	13ft 3in	(4m ²)
Aerofoil section	NACA M12 (modified)	
Maximum cross-sectional area of fuselage	28ft ²	(2.6m ²)

drawings suggests that the Griffon was to be evaporatively cooled, in line with Rolls-Royce's preference at the time, and that the panels shown on the outer-wing leading edge (as shown on the general-arrangement drawing **ABOVE**) are likely to be condensers rather than leading-edge slats.

In an evaporatively-cooled engine water passes through the engine under pressure, allowing it to run at high temperature without the water



The author's three-dimensional rendering of Folland's High-Speed Mail Carrier with the British civil registration G-ABWC, which fell between a pair of de Havilland Fox Moths in the early 1930s and was never allocated. Note the clear-vision panel set into the forward fuselage to improve the pilot's view on landing, and the "eyebrow" aerofoil above the windshield, first seen on Folland's unbuilt monoplane Charter Airliner of 1931.

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boiling. On exiting the engine the water is depressurised and flashed to steam, which is then cooled in suitable condensers before returning to the engine. This system was expected to be both lighter and more compact than a conventional water-cooled arrangement. In practice, however, the installation proved troublesome in a number of aircraft and the idea was abandoned. No weights or performance figures appear to have survived for the Mail Carrier but it is readily apparent that the aircraft would have proven to be fast and far exceed Imperial Airways' specifications.

MAILPLANE OR BOMBER?

Was this design also intended as the basis for a bomber? An indication that this might have been the case takes the form of a contemporary project design by Supermarine. The project did not proceed beyond basic concept drawings and never received an official company type number, but it was drawn up in two forms; as a high-speed bomber and as a mailplane. In both, the payload was to be carried within the inner wings.

As with Gloster's design, the aircraft was a low-wing monoplane with retractable undercarriage; it was to be powered by an evaporatively-cooled Rolls-Royce Griffon. It surely has to be more than coincidence that the two companies were

working simultaneously on such similar concepts.

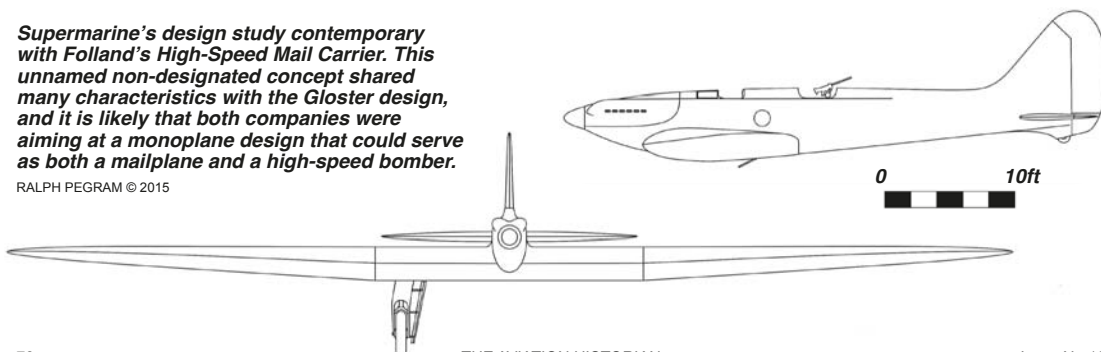
Gloster tendered the Mail Carrier monoplane to Imperial Airways but later hedged its bets by submitting a second tender in September 1932 for a simple biplane based on its AS.31 Survey. This could be used as either a mailplane or a charter airliner carrying six passengers, but the range and speed were both below that specified by Imperial Airways. Neither design was accepted.

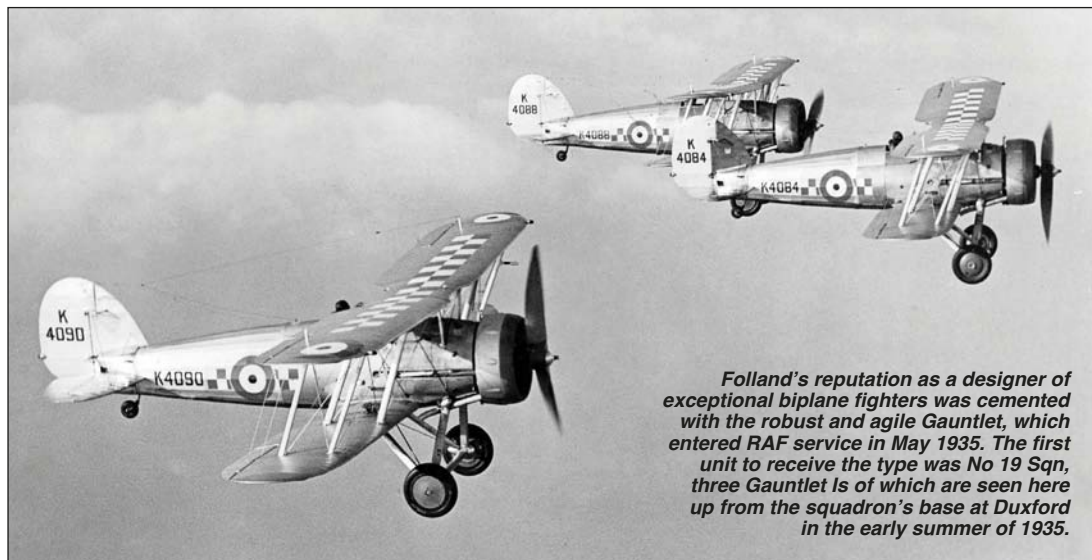
Imperial opted for a more conventional aircraft to fulfil its mailplane requirement and ordered the twin-engined fixed-undercarriage Boulton Paul P.64 biplane. The Air Ministry did not pursue the idea for the High-Speed Bomber at this stage and no official specification was written. Rolls-Royce abandoned development of the Griffon in favour of a new smaller engine of comparable power; the PV.12, later renamed the Merlin.

In the meantime, other new ideas had been under investigation by Folland's team. In 1931 Duncanson, who had patented a form of variable-camber wing associated with his single-spar system, published an article in *Flight* describing the benefits of this type of wing. Interestingly, Gloster had been contracted by an Italian, Ugo Antoni, to build an alternative form of variable-camber cantilever wing of his own design. The design team had, as a consequence, notable

Supermarine's design study contemporary with Folland's High-Speed Mail Carrier. This unnamed non-designated concept shared many characteristics with the Gloster design, and it is likely that both companies were aiming at a monoplane design that could serve as both a mailplane and a high-speed bomber.

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Folland's reputation as a designer of exceptional biplane fighters was cemented with the robust and agile Gauntlet, which entered RAF service in May 1935. The first unit to receive the type was No 19 Sqn, three Gauntlet Is of which are seen here up from the squadron's base at Duxford in the early summer of 1935.

expertise in both the theoretical and practical aspects of these innovative monoplane wings, but no opportunities to capitalise on this appear to have arisen. Work was also progressing on development of the Hele-Shaw Beacham variable-pitch propeller.

By 1932 there was a pressing need to address Britain's ageing bomber fleet, which was rapidly becoming outclassed by the latest fighters. The mix of light, medium and heavy bombers was under review, as was speed, load and range for each class. In late 1932 the Air Ministry drew up a series of new Specifications, including P.27/32, which requested designs for a light bomber to replace the Hawker Hart.

This was issued to industry in April 1933 and included most of the requirements formulated for the conjectural high-speed bomber; a monoplane carrying a load of 1,000lb, a range of 1,000 miles and a top speed of at least 200 m.p.h. It may have been expected that Folland would simply dust off his Mail Carrier design and restructure it as a bomber, something which would surely have been a fairly simple job — but there was a problem. Duncanson had quit the company in early 1933 and moved, along with his wing-spar patents, to Blackburn.

The loss of other staff members, notably George Dowty, meant that Folland's design department was beginning to look distinctly depleted, and the remaining staff were working feverishly on two derivatives of the SS.19A. Persistence and patience had finally borne fruit and a production contract was imminent for a considerable number of the new fighter, the SS.19B Gauntlet.

The company was also preparing a series of substantial upgrades of the Gauntlet design as a back-up in case of problems with the many designs submitted to F.7/30; the Air Ministry was already having misgivings regarding the quality of some

of these and was becoming increasingly concerned over the slow progress in the construction of the prototypes. Gloster's improved aircraft would become the SS.37 Gladiator.

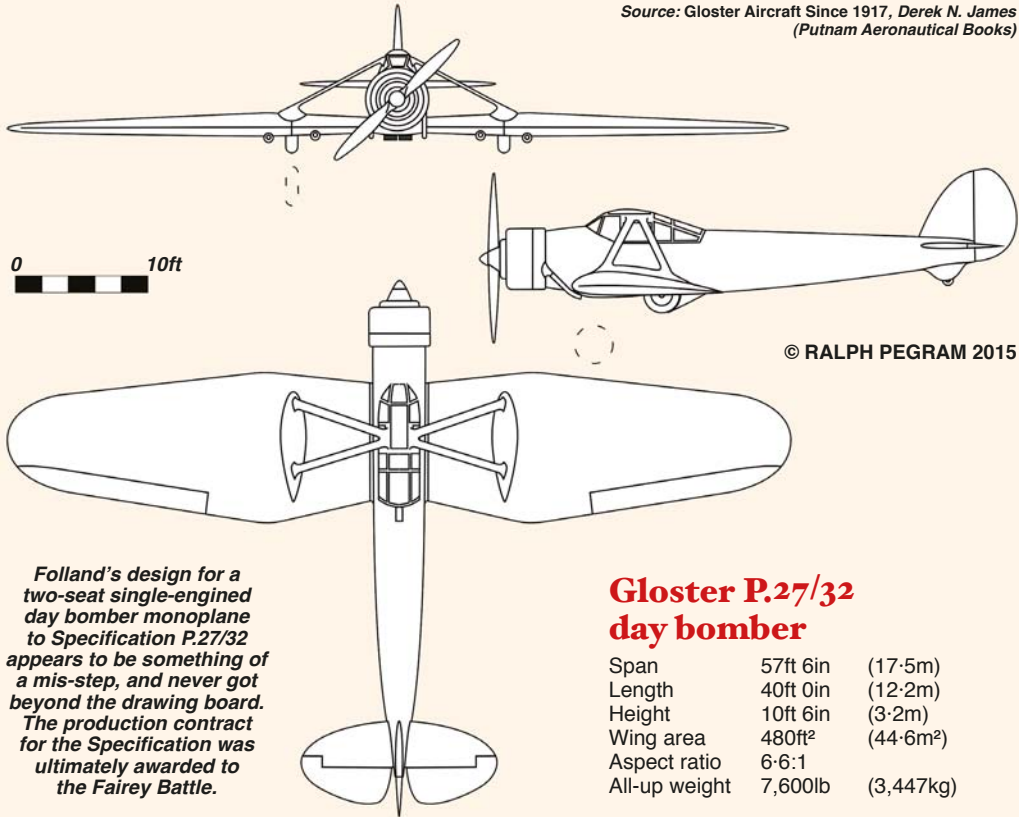
THE HAWKER MERGER

This turnaround in the company's fortunes had come just too late for Gloster, and the management was already in deep discussions with the recently recapitalised Hawker Aircraft Ltd, which had approached Gloster with a takeover offer in May 1934. Hawker was in urgent need of additional production capacity to handle orders for the Hardy, Hartbeest and Audax, all Hart derivatives. A deal would be struck and completed the same year.

In the stressful climate that prevailed in late 1933 Folland's creative mind seems to have faltered, and the design he produced to Specification P.27/32, for a single-engined day bomber, appears a distinct step backwards. With General Aircraft Ltd manufacturing its own Monospar aircraft (as described in the first part of the author's series on Folland monoplane designs, in TAH9 — Ed), and Duncanson having taken the tubular spar concept to Blackburn, where it would be constructed and test flown in 1934, Folland was without a readily available cantilever wing design.

As a consequence he fell back on a distinctly anachronistic twin-spar structure with strut-bracing to the fuselage. Vee-struts on each side ran from fairings on the upper wing to the top of the cockpit. The undercarriage retracted to the rear, leaving half the wheel exposed, and two Vickers guns were mounted below each wing on either side of the undercarriage.

The fuselage was a Duralumin monocoque structure with a large glazed cockpit for the pilot and gunner. The roof glazing of the rear cockpit could slide and the side windows folded away to



provide the gunner with a clear field of fire for his Lewis gun. The bombload was presumably carried entirely within the fuselage, although this is not clear from the layout drawings. The aircraft was to be powered by an 810 h.p. Armstrong-Siddeley Tiger VI radial engine, which would give an estimated cruising speed of 168 m.p.h. (270km/h), way below Air Ministry requirements.

Other designs tendered to the Air Ministry to P.27/32 included those for the Fairey Battle and Armstrong Whitworth AW.29; both received contracts for the construction of prototypes while the Gloster design was rejected. The AW.29 was powered by the same Tiger engine as planned for the Gloster and was slightly heavier. Its cruising speed was 208 m.p.h. (335km/h) with a maximum of 225 m.p.h. (362km/h), which may indicate that the performance data for Gloster's project were incorrect.

A RETURN TO FIGHTERS

Folland's focus now returned to fighters. Specification F.5/34 had been intended to provide the replacement for the Hawker Fury, and should have led to major production contracts, but the document was much delayed through uncertainty within the Air Ministry, prompted in no small degree by the work undertaken by Hawker and

Supermarine under the Experimental Fighter programme. This, of course, resulted in the Hurricane and Spitfire respectively.

By the time the Specification was issued to industry in November 1934 both the Spitfire and Hurricane had been ordered as high-priority projects. Specification F.5/34 called for a single-seat single-engined fighter armed with six or eight guns, a maximum speed in excess of 275 m.p.h. (440km/h), a ceiling of 33,000ft (10,000m) and endurance of 1½hr. Any engine could be used, although it is assumed that selection of the Rolls-Royce Merlin would have been discouraged. While it was obvious that the Air Ministry placed great faith in the Hurricane and Spitfire and their Merlin engines, there was definite merit in assessing alternative designs.

Thus four aircraft types were approved for construction; one each from Gloster, Vickers, Bristol and Martin-Baker. Gloster's unnamed fighter proved to be very much the best of the bunch and, as it is well known, will not be reviewed in detail here. Suffice to say that Folland's F.5/34 design is too often dismissed as little more than a monoplane Gladiator, when in fact it drew upon nothing at all from its illustrious predecessor other than the choice of the same Bristol Mercury engine. It was a sophisticated



A three-dimensional rendering of Folland's uncharacteristically ungainly design to Specification P.27/32. As well as a rearward-facing gunner's position, the aircraft was to be armed with a pair of fixed forward-firing Vickers 0.303in machine-guns under each wing.

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all-metal stressed-skin aerodynamically refined aircraft and a fine design for 1935, equalling the performance of the early production Hurricanes on some 20 per cent less engine power. However, the Air Ministry assigned relatively low priority to all the F.5/34 aircraft, and Gloster was instructed to concentrate its efforts on production of the Gauntlet and Gladiator. Nevertheless Folland had ideas in mind to improve the fighter.

BE BOLD, BE ORIGINAL

As the Hurricane and Spitfire projects took shape, funded initially as experimental fighter designs, some within the Ministry saw that there could be merit in allowing aircraft designers an even freer hand to consider a specialised high-speed aircraft outside the mainstream Air Staff requirements, but which it was hoped would result in novel ideas for future fighters. Consequently the

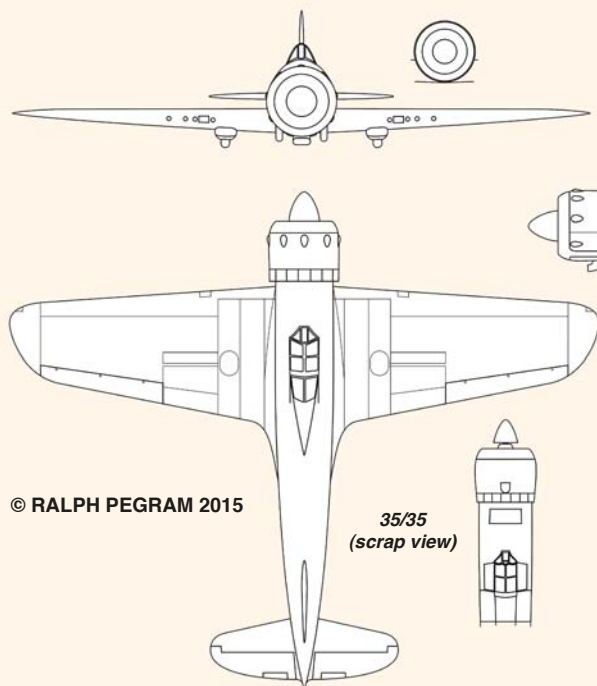
Ministry issued Specification 35/35 in December 1935 for just such an aircraft, requesting a top speed of more than 400 m.p.h. (645km/h) and emphasising a desire for boldness and originality.

Folland saw this as an ideal opportunity to refine his existing fighter design and his proposal was a clear development of his design to F.5/34. The "new fighter", as Folland referred to the design, was to be powered by a Bristol Taurus 14-cylinder twin-row sleeve-valve radial engine (derived from the Aquila), that was then under development and anticipated to produce more than 1,050 h.p. As its diameter was a full 5in (127mm) less than the Mercury it was to replace, Folland was able to design a new slimline fuselage with a lowered cockpit and an aerodynamically cleaner canopy. Although it reduced visibility to the rear somewhat, there was to be a spine extending from

TAH ARCHIVE

Significant in being the first Gloster monoplane to fly, the first F.5/34 climbs away from Hucclecote some time after its maiden flight in December 1937. Two examples were built, K5604 and K8089, but although the type showed a good deal of promise, its thunder was comprehensively stolen by the advent of the Spitfire and Hurricane.





35/35 (scrap view)

Gloster F.5/34 & 35/35

The design by Folland and Howard Preston to Specification F.5/34 was the first of Folland's monoplane fighters and the last of his Gloster designs to fly. Echoes of its shape and layout would surface in the E.28/39 jet, a product of Folland's successor, George Carter.

0 10ft

The author's illustrations of the F.5/34 are drawn from a number of sources and the 35/35 scrap views are based on documents in the archive of the Jet Age Museum (www.jetagemuseum.org).

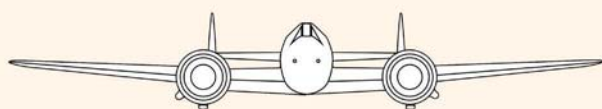
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35/35 (scrap view)

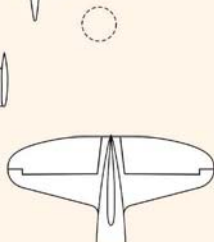
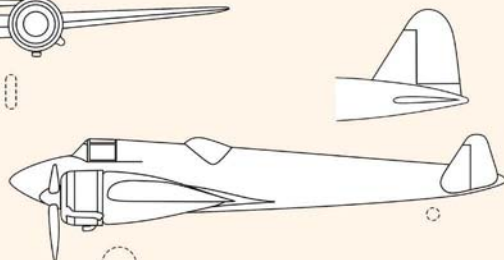
Gloster F.34/35

Span	43ft 10in	(13.36m)
Overall length	37ft 0in	(11.28m)
Wing area	325.5ft ²	(30.24m ²)
Aspect ratio	6:1	
All-up weight	8,015lb	(3,636kg)

Folland's design to Specification F.34/35 for a twin-engined two-seat fighter with a four-gun power-operated dorsal turret and nose armament, as tendered in 1936. Single-finned and twin-finned configurations were drawn up, but again Folland's hopes were dashed when the project was abandoned.



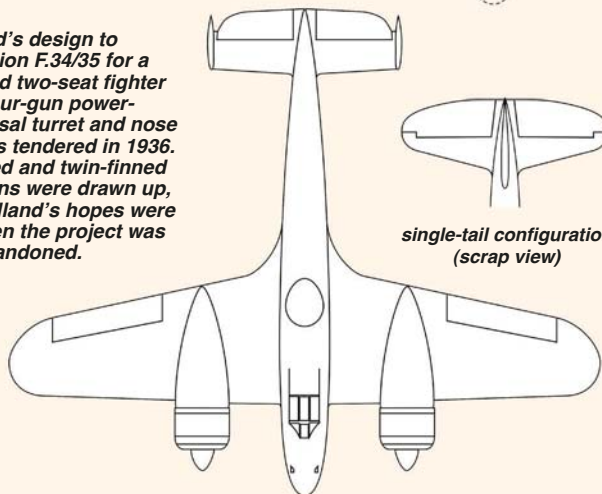
single-fin configuration (scrap view)



single-tail configuration (scrap view)

These F.34/35 illustrations are redrawn from an aerodynamic datasheet held by The National Archives (www.nationalarchives.gov.uk).

0 10ft



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ABOVE *The author's three-dimensional impression of the Bristol Aquila-powered twin-tailed Gloster F.34/35. It is shown bearing the RAF serial K8625, which was allocated to the type before development work on the design was cancelled when the Boulton Paul Defiant was built to Specification F.9/35, which covered the requirements of both.*

the rear of the cockpit to the tail, Spitfire-style.

The wings were reduced in chord and area but reportedly retained Folland's favoured aerofoils — NACA 2218 (at root) and 2209 (at tip) — as he had selected for the F.5/34 and F.34/35 fighters. Two machine-guns were to be mounted in each wing. Full general-arrangement drawings of this design may still exist but their current whereabouts is unknown. On paper at least, this design looked like the basis for a promising fighter. However, the worsening political situation abroad and changing Air Ministry priorities soon led to a reassessment of the need for the Specification, which was not especially challenging and resulted in conventional designs from all but Airspeed (which proposed a novel twin-boom design), and it was withdrawn.

Back in mid-1933 Specification F.5/33 had called for a two-seat fighter with a forward-mounted gun turret. However, little is known about the majority of the designs tendered, of which there are thought to have been at least five. Gloster submitted a design for a low-wing monoplane powered by two Bristol Aquila radials, but no drawings or details appear to have survived.

A single prototype was ordered from Armstrong Whitworth (designated AW.34) but was cancelled before construction began. The Gloster design is then thought to have been used by Folland as the basis for his submission to meet Specification F.34/35 issued at the end of 1935, also for a turret fighter, but with the four-gun turret mounted in the dorsal position and the addition of two fixed forward-firing guns. Folland tendered a small, sleek design powered by two 600 h.p. Bristol

Aquila radial engines driving variable-pitch three-bladed Hele-Shaw Beacham propellers, for which Gloster held the patents, giving a top speed of 300 m.p.h. (480km/h).

A low-drag dorsal turret of indeterminate type, and possibly retractable, was featured on the initial drawings, which also offer alternative single- or twin-finned tails. This design was well-received and a prototype was ordered in 1936, only to be cancelled before construction commenced when it was deemed that the aircraft would offer little advantage over the similarly armed single-engined Boulton Paul Defiant.

In a final twist, Folland's F.34/35 design, on which a Gloster team under the supervision of George Carter had undertaken a considerable amount of revision and development work, was uprated and re-engined to meet Specification F.9/37 for a twin-engined single-seat fighter. This time Gloster received a contract for, and built, two prototypes. But that was to be long after Folland's departure from the company.

Throughout 1936 Henry Folland had been deep in thought regarding his future at Gloster, but he had one last design for the company to consider; a monoplane bomber designed around Major Robert Mayo's "piggyback" concept. It was certainly bold, and indeed original — but would it work?



NEXT TIME *In the third and final part of his series on Henry Folland's forgotten monoplane designs, Ralph Pegram describes the increasingly disillusioned Folland's final design for Gloster and his ultimate departure from the company for pastures new*

“SOME SUPREME EFFORT...”

When Tobruk fell to Rommel's Afrika Korps in June 1942, it appeared to be only a matter of time before Axis forces rolled into Cairo, the strategically vital Egyptian capital, as conquerors — unless a heroic endeavour by Allied air transport crews could deliver desperately-needed ammo and equipment to the beleaguered British in North Africa. **RAY FLUDE** details a little-celebrated intercontinental first

ON JUNE 21, 1942, Tobruk, the fortress upon which the British had relied to hold back the Axis surge along the North African coast, was overrun by German and Italian forces and fell after only the briefest of sieges. Some 30,000 British and Commonwealth soldiers were taken prisoner, huge supply dumps were left intact in enemy hands and ten days later the German and Italian forces stood within 60 miles (100km) of Alexandria. The Axis threat was aimed at the very keystone of the British global position because Egypt was the crucial communication hub for all the routes to the Empire.

In April that year the aircraft carriers of the Japanese Combined Fleet had moved in force into the Indian Ocean following the fall of Singapore, leaving the British Navy powerless, and threatening the possibility of Japanese landings in Ceylon and the cutting of the Allies' shipping routes to and from Egypt and the Persian Gulf. There now appeared to be a real possibility of a link-up between the major Axis powers in the Middle East and, against the backdrop of the recent catalogue of British military disasters, the British feared the worst. It seemed to be a moment when Britain could be forced out of the war. Rommel was poised to take Egypt. Mussolini was ready for the victory parade through Cairo. The British fleet had withdrawn through the Suez Canal to the Red Sea.

On June 30, 1942, the American Ambassador in Egypt, Alex C.

MAIN PICTURE *The first of the RAF's Liberators, AM258 was designated as an LB-30A and is seen here taxiing in at the Consolidated factory at San Diego before its delivery to the UK in March 1941. The Liberator's advanced high-aspect-ratio wing, designed by David R. Davis, gave the aircraft remarkable range — an asset that was to prove invaluable during the Middle East airlifts of 1942.*

BOB LIVINGSTONE COLLECTION



ENDNOTE references, indicated by numbers at appropriate points in the text, are provided at the end of the feature.



LEFT Members of an American tank crew pose beside their M3 during the race to cut off Axis forces in Tunisia in November 1942. The M3 was the basis of the British Grant tank, both incorporating a main 75mm gun offset to starboard in the hull and a turret housing a 37mm gun. The GIs here display various types of the 75mm ammunition that was a major component of the Liberators' payload during the vital 1942 airlifts.





LEFT True allies — largely thanks to the availability of air transport, Franklin D. Roosevelt (left) and Winston Churchill were able to establish an excellent working relationship and met regularly for invaluable face-to-face meetings. The pair are seen here at the first Quebec Conference in August 1943.

BELOW Boeing 314A Clipper G-AGBZ (c/n 2081), named Bristol, was one of three purchased by BOAC in 1941, the others being G-AGCA Berwick and G-AGCB Bangor. All returned to the USA and reverted to their American civil identities (NC18607, NC18608 and NC18610 respectively) in April 1948.

Kirk, wrote to the State Department about his fears. He was convinced that Rommel would arrive as a conqueror in Cairo “unless the British can obtain, immediately, reinforcements of anti-tank and air artillery . . . the situation could be redeemed if hundreds of bombers with anti-tank guns were being flown in . . . I can’t escape the feeling that the scales might be turned even now by some supreme effort”.¹

THE FALL OF TOBRUK

Tobruk fell while the second Washington conference was taking place between Franklin D. Roosevelt and Churchill and their attendant advisers. Churchill and General Sir Alan Brooke had left Britain on BOAC Boeing 314 Clipper G-AGBZ *Bristol* from Stranraer on June 17 on a 27hr flight, taking off after dark to avoid German Focke-Wulf Fw 200s on patrol over the Atlantic.

Although the British and Americans were beginning to make great use of their air transport capability, with political and military leaders from Britain, America and the Soviet Union all using air transport to meet face-to-face to discuss and agree joint strategy and operations, flying such long distances across the Atlantic was still a leap into the unknown. Churchill, very well aware of the risks he was running, had taken the precaution of advising the King, before leaving, that if he, Churchill, should be killed, Anthony Eden should be invited to lead a government.

The shocking news of the sudden fall of Tobruk arrived while the conference was in full swing and the news was actually given to the British delegation in the White House. Brooke described it as “a staggering blow”.² Churchill said he felt ashamed, particularly because of the humiliation of hearing the news in front of the Americans.



After President Roosevelt famously declared in March 1941 that the USA would become the "arsenal of democracy", the M3 tank quickly became the most tangible symbol of that statement of intent. The British Army eventually received 2,855 examples of the M3 General Lee and General Grant variants. This US Army M3 was photographed near the Kasserine Pass in Tunisia in February 1943.



But, on reflection, Brooke also felt that the way the crisis was dealt with, face-to-face between key people, helped to lay firm foundations of friendship and understanding between Churchill and Roosevelt and General George C. Marshall and himself. Within hours it had been agreed that the need to shore up the British position in North Africa took priority regarding the use of American equipment, and that there should be an immediate allocation of 300 Sherman tanks and 100 x 105mm self-propelled guns, previously earmarked for a US Armoured Division, to the Middle East to help reinforce the British position.

Tobruk fell on June 21 and the decision to send the tanks and guns had been made by June 25. This rapid response to Britain's predicament was an indicator of the value of in-person meetings between key Allied decision-makers supported by one aspect of the Allies' growing air-transport capacity. But these rapid decisions, although a strong symbol of Allied coordination, could not be enough on their own to safeguard the situation in the Middle East. Another aspect of the Allies' growing air-transport capability was that it had to play an operational role, with rapid delivery of vital supplies to the Middle East during this crisis.

A CRUCIAL NEED FOR AIR SUPPORT

The turning point in the North African campaign was the way that British forces blunted, and then halted, Rommel's headlong dash along the North African coast at the first battle of El Alamein during July 1–27. Rommel himself realised the importance of that first El Alamein battle, "for what mattered to [British Eighth Army Commander Gen Claude Auchinleck] was to halt our advance and that, unfortunately, he has done".³ Of course, this important battle took place before the reinforcement by sea agreed at the

Washington conference could make a difference.

The deliveries of tanks and guns from the USA, agreed at the end of June, could not arrive in Egypt until early September. Supplies of all kinds, having to come from Britain or the USA via the Cape of Good Hope, generally took a minimum of 10–13 weeks to arrive. When Tobruk fell there was already a chain of supply convoys spread out between Britain and Suez, loaded with what had been the priority supplies and equipment decided upon some weeks before. The British forces faced major supply problems as a result of the long retreat. The lack of spares for guns and engines meant that on July 1 at least 100 British Grant tanks were in the workshops awaiting repair.⁴ In the retreat towards Egypt between May 27 and July 1 there had been huge losses of ammunition, as stocks which could not be evacuated were destroyed. One estimate put the loss at 81,578 rounds of 75mm ammunition, 146,442 rounds of 37mm ammunition and 512,752 rounds of 25-pounder ammunition.⁵

It was necessary to move essential supplies to the Middle East to make good these deficiencies in time to affect the outcome. The British could make some immediate contribution by diverting shipments of aircraft, tanks and supplies intended for India to the Middle East. But it was at this point that air transport could make an operational contribution by rapidly delivering vital additional supplies over long distances to the forces on the ground during the battle.

Through discussion and agreement in Washington the British used Consolidated B-24 Liberator aircraft supplied by the Americans, flown by British and Canadian crews, to transport ammunition from the USA via South America and West Africa to Cairo; and to transport other supplies to Cairo from Britain via Gibraltar in

order to provide support to the British and Commonwealth troops using American tanks and aircraft in North Africa. This is an excellent example of the way the Allies were working together and using air transport, and it was the first time that a major operation to supply armed forces by air during the battle itself was undertaken between continents and across oceans.⁶

On June 30 Alex Kirk had written to the State Department suggesting that an airlift using bombers to bring in anti-tank guns seemed to him to be the only way that Rommel could be stopped. Marshall seems to have raised this idea with Field Marshal Sir John Dill, Senior British Representative on the Combined Chiefs of Staff, based in the USA. Dill (seen at **RIGHT**) responded quickly, identifying the most urgent shortages and explaining the outcome of a rapid investigation into the feasibility of an airlift in a letter to Marshall on July 3.⁷

BRIDGING THE GAP

Dill identified a serious gap in the supply of tank ammunition from the USA which would become critical in mid-July, based on an analysis of stocks and the loads already expected on ships in the chain stretching back to Britain and the USA. The problem was specifically supplies of ammunition for the 37mm gun which was the secondary armament in Grant tanks, backing up the main 75mm gun, and the main gun for the lighter Stuart tanks. The Grant was the only tank available to the British at this point which could provide a decent match for the German tanks.

At the beginning of July, after the recent fighting



and the retreat, Middle East Command had only 20,000 rounds of 37mm tank ammunition available to last until the next major deliveries arrived by sea. The pattern of shipments in place meant that there would be a serious gap in deliveries by sea during July 9–24. After that date the deliveries already in the convoy pipeline meant that the shortages could be made up.

To meet that two-week gap in supplies — in the middle of what was to become the first battle of El Alamein — Dill explained that the British planned to deliver the ammunition by air and that work had already started on this. RAF Ferry

A Liberator taxis in at Prestwick after a non-stop flight across the Atlantic as part of the Return Ferry Service in the summer of 1942. That July Liberators were used to open up a North Atlantic route to the Middle East, bringing vital supplies of ammunition and equipment across from North America and taking them on to Cairo via Gibraltar.

PHILIP JARRETT COLLECTION





Command had already positioned four Liberators on the South Atlantic route and hoped to be able to provide at least another three in a day or so. This would allow deliveries of 7,000 rounds of 37mm ammunition to Cairo, but Middle East Command needed a minimum of 10,000 rounds and could really do with 20,000 rounds to double its stocks for the crucial two weeks.

A package of 400 rounds of 37mm ammunition weighed one ton, which meant that a single Liberator could carry 1,000 rounds weighing 5,600lb (2,540kg) in a single load. As well as explaining the British plans, Dill asked Marshall

TOP Air Chief Marshal Frederick William Bowhill, Air Officer Commanding RAF Ferry Command during the crucial Middle East airlifts of 1942.



to arrange for the US Army Air Corps Ferrying Command (renamed Air Transport Command on July 1, 1942) to deliver an additional 5,000 rounds of the vital 37mm ammunition, using its aircraft.

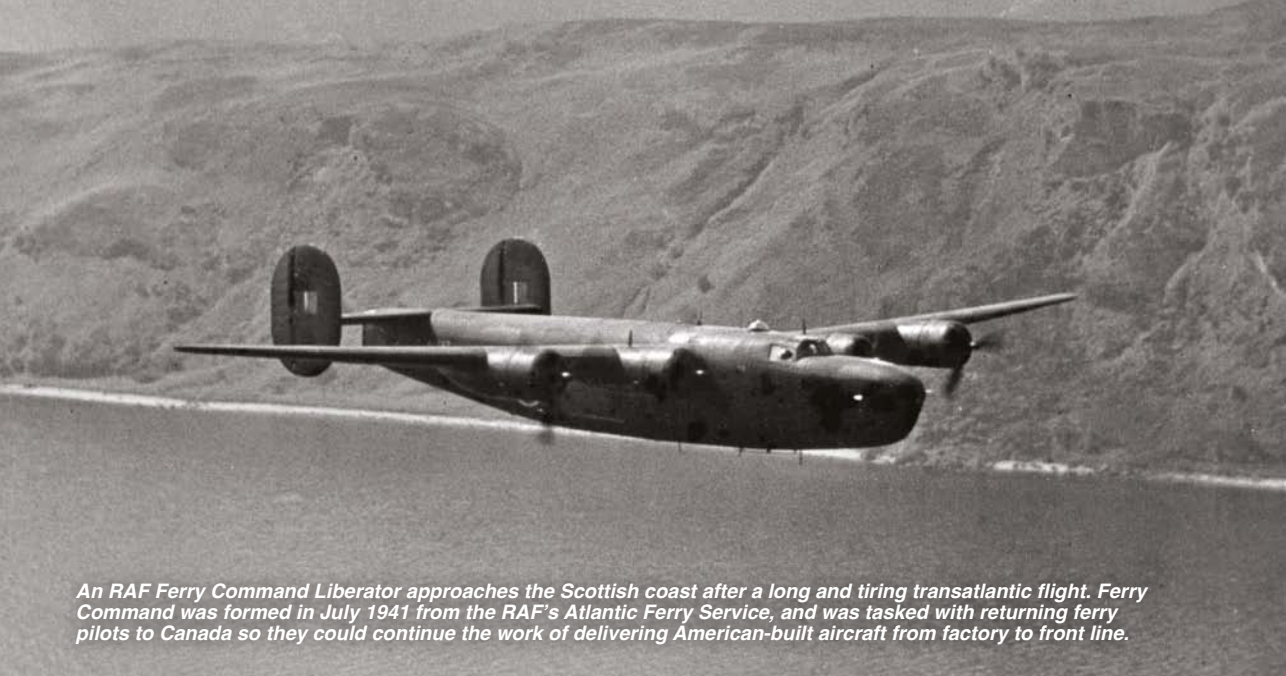
On July 8, as the initial RAF flights across the South Atlantic were already taking place, Dill told Marshall that the British had made arrangements to fly out a further 10,000 rounds using Liberators "set up for our Coastal Command". These were aircraft already scheduled to be delivered by air to Britain for use by RAF Coastal Command. This was another sign of the urgency of the mission — the Liberators were desperately needed for the vital protection of convoys.⁸

The newly-minted Air Transport Command had already had a military South Atlantic transport service in place from November 1941 as part of Ferrying Command, and by July 1942 was organised with five B-24D Liberators, four Pan-American Boeing Clippers and two TWA Boeing C-75 Stratoliners available on the section of the route from Natal, Brazil, over the South Atlantic to West Africa. The total delivery capacity was considered to be nine tons (9,140kg) of freight a day.⁹ Colonel John R. Deane, later to head the US Military Mission in Moscow, confirmed on July 9 that the extra 5,000 rounds of 37mm ammunition requested had already been despatched from the Raritan Armory in New Jersey to Miami by road, where it would be picked up by the American transport aircraft. He estimated that delivery of the 5,000 rounds of 37mm ammunition, weighing 12½ tons (12,700kg), would utilise the full capacity of the American delivery service for about 2½ days and would inevitably delay the delivery of other urgent supplies. Dill understood this.

PROVING THE SOUTHERN ROUTE

Air Chief Marshal Frederick W. Bowhill of RAF Ferry Command was in charge of the airlift to Cairo across the South Atlantic and his Senior Air Officer, Griffith J. "Taffy" Powell, was the man who had to put it into effect. During July, 14 Liberators were converted to freighters and placed on the South Atlantic run. Some 70 crew members were chosen, including the most experienced captains. Most of the crews were American and Canadian civilians because RAF personnel had mainly been directed to combat missions. To carry the maximum payload the machines operated at above the recommended take-off weights; and before departure from RAF Ferry Command's main base at Dorval, Montreal, they had their turrets, armour plate and ammunition tracks removed. Powell stated that they also removed the de-icing gear from the aircraft to save weight.¹⁰

The USA's Air Transport Command agreed that the RAF Liberators would take priority at all the



An RAF Ferry Command Liberator approaches the Scottish coast after a long and tiring transatlantic flight. Ferry Command was formed in July 1941 from the RAF's Atlantic Ferry Service, and was tasked with returning ferry pilots to Canada so they could continue the work of delivering American-built aircraft from factory to front line.

PHILIP JARRETT COLLECTION

American air bases along the route. The first wave, of four RAF Ferry Command Liberators, was to test the route and facilities at all the stopping points. According to the Ferry Command plan, these first four aircraft would also help to clear the backlog of spares for aircraft and tanks for the Middle East, and also carry spares for the West African bases which were involved in ferrying fighters and medium-range bombers across the route to Cairo.¹¹ The many Grant tanks awaiting repair in the workshops in the Middle East were just one sign of the desperate lack of spares for guns and engines.

This first group of Liberators — FK214, FK227, FK243 and FL911 — left Montreal during July 2–4, and, stopping at West Palm Beach in Florida to collect loads, flew to Trinidad, Belém and Natal in Brazil and across the South Atlantic, arriving in Accra, Ghana, on July 11.¹² The loads were

then flown across to Kano in Nigeria, Khartoum in Sudan and Cairo — a total journey of 11,000 miles (17,700km), crossing two continents and the South Atlantic.

The other ten converted Liberators were to fly the 37mm tank ammunition to the Middle East. The next group of six Liberators — FL908, FL909, FL914, FL915, FL917 and FL920 — left Dorval during July 7–10 and flew to Mitchel Field on Long Island, New York, to load.¹³ The ammunition had already been stockpiled in New York because it had been expected that it would need to go by ship. The Liberators reached Accra by July 15 and flew across Africa via Kano and Khartoum, all having arrived in Cairo by July 17.

The final group of four aircraft — FL912, FL913, FL918 and FL922 — left during July 12–16, collecting ammunition and arriving in Cairo on July 21, August 5 and August 7.¹⁴ After their

Liberator III FL918 was one of 14 examples converted to freighter configuration and operated on the South Atlantic Route during the 1942 Middle East airlifts. It was used by BOAC as G-AGFR and later by No 246 Sqn before being struck off charge in January 1947.



ALAN GRIFFITH COLLECTION VIA BOB LIVINGSTONE

THE MIDDLE EAST RESUPPLY AIRLIFTS JULY 2 – AUGUST 7, 1942

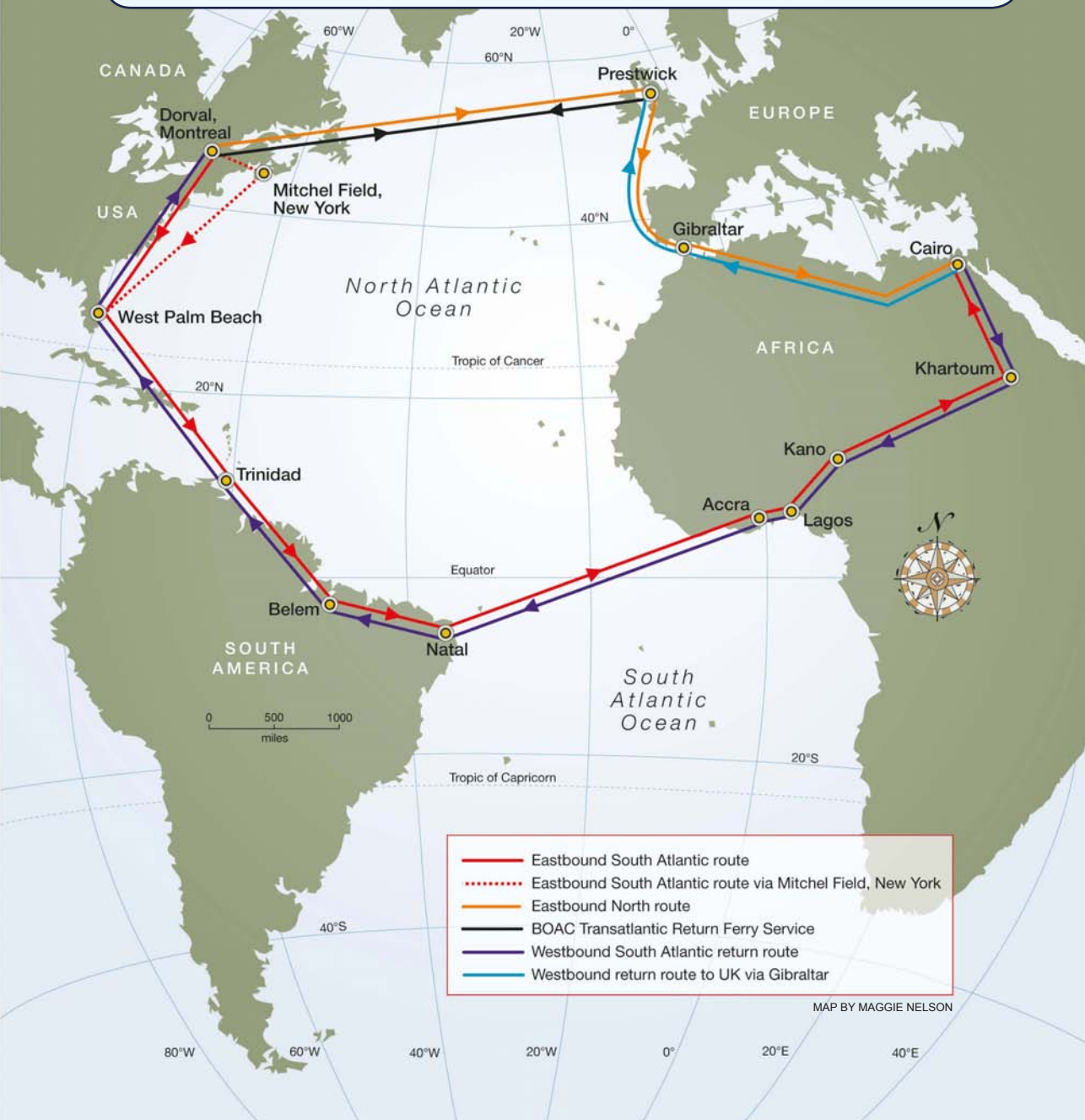
THE SOUTH ATLANTIC airlift to supply the Middle East ran from July 2 to August 7. Airlifts via Gibraltar ran from July 14 to August 4.

	South Atlantic; RAF	South Atlantic; USAAC	Via Gibraltar; RAF
Aircraft used	14*	Within the regular route	6
Flights made	22**		8
Total load	54 tons (54,866kg)	12½ tons (12,700kg)	21 tons (21,335kg)

* Another aircraft joined the airlift at the end of July and flew one delivery flight

** Six made a second trip and one made a third within a month

Four Liberators stayed on the South Atlantic route throughout August 1942 to help clear the backlog of supplies and parts at West Palm Beach. On the route via Gibraltar, BOAC/Ferry Command Liberators were called in at times during August, September and October to carry further urgent supplies to Cairo.



original deliveries to the Middle East, four of the ammunition-carrying Liberators flew straight on to the UK via Gibraltar, arriving during July 25–31. It is a sign of how blasé the British air transport services were becoming about the long and complex aerial journeys being undertaken that these aircraft were identified on arrival as being delivered from Montreal to Britain, “across the South Atlantic via West Africa to Cairo for the purpose of delivering loads of war materiel to Middle East Headquarters, and then flown on to this country for final delivery”.¹⁵

Meanwhile, the other six ammunition-carriers, as well as the original four which had carried spares and other equipment, made their return westbound flights to the USA carrying loads of raw rubber. The average eastbound load was 6,200lb (2,810kg) of ammunition and the average westbound was 6,048lb (2,745kg) of rubber. During July, 50,106lb (22,720kg) of raw rubber was picked up from Roberts Field in Liberia and flown to the USA.¹⁶ This was probably supplied from the Firestone Rubber plantation nearby, which was one of the largest in the world. There was a major shortage of natural rubber in the USA at this time.

THE NORTH ATLANTIC ROUTE

In July 1942, in addition to the deliveries via the South Atlantic Route, there was another parallel operation to resupply the Middle East using another long-distance airlift route, with aircraft flying across the North Atlantic from Dorval to Prestwick on the Atlantic Ferry Return Service

route, moving on to RAF Lyneham and then following a newly-opened air-supply route to Cairo via Gibraltar. This emergency airlift also used Liberators and operated to the same deadlines and targets which Dill had established at the beginning of July.

From April 1942 the route had been opened for heavy transport aircraft from Britain to Cairo using the newly extended runway at Gibraltar. The RAF's No 1425 Flight operated a shuttle service over the new route, which although more direct, was still more than 3,500 miles (5,630km) each way. The Air Ministry wanted to boost the capacity on this route for the same period which Dill had identified as the supply bottleneck, and it undertook this by using BOAC and RAF Ferry Command Liberators from the North Atlantic route to make deliveries to Cairo in between their usual transatlantic flights. The instructions for No 44 Group were delivered on July 10, 1942, and were summarised in the log as follows:

“Instruction received from Air Ministry for the conveying of 44,000lb [19,960kg] urgent freight by air Middle East; 22,000lb [9,980kg] by July 21, remainder at a minimum rate of 10,000lb

A JOB FOR **COMMANDO**

IT WAS CLEAR that the 1942 Middle East airlift would require all hands to the pumps for Ferry Command and Liberator AL504, named *Commando*, also became involved in the airlift. This aircraft was the VIP transport that later carried Churchill to Moscow. It had arrived at Bathurst (now Banjul) in Gambia, on July 10 to deliver Lord Swinton, the Minister Resident in West Africa; but, as it was in the right place at the right time, it was tasked with transporting ammunition from Accra to Cairo. The ammo may have been from one of the Liberators which lost an engine at Kano in Nigeria. *Commando* arrived back at RAF Lyneham, in company with one of the South Atlantic airlift Liberators, on July 25.



BOB LIVINGSTONE COLLECTION x 2



A BOAC Liberator takes off from Dorval, Montreal, bound for Prestwick in Scotland. One of the pilots involved in the 1942 Middle East airlifts was Capt Don Bennett (later to lead RAF Bomber Command's Path Finder Force), who flew AL512 laden with 6,550lb of materiel to Cairo via Gibraltar on July 15, 1942.

PHILIP JARRETT COLLECTION



“ What we must marvel at is the speed of the response to the crisis believed to be emerging at the beginning of July 1942, and the execution of two airlifts across vast distances against a very tight deadline ... ”

[4,535kg] per week. Five Liberators from RAF Ferry Command with BOAC crews to be attached to 1425 Flight. No 44 Group responsible for briefing and despatch”. The following aircraft were also specifically mentioned: AL528, AL512, AM259 and AM258.

The first of the additional aircraft was due to arrive on July 13 and the first consignment of 6,000lb (2,720kg) of freight to be carried to the Middle East was due to arrive by road at Lyneham on the same day. The urgency of the operation was stressed. The aircraft were to proceed to Cairo from Gibraltar on the same day they arrived and to turn around at Cairo for the return flight within 24hr.¹⁷

There is evidence to suggest that the South Atlantic airlift carried 37mm tank ammunition as well as aircraft and tank parts. It is not clear what was carried as part of the airlift via Gibraltar; possibly more ammunition and spare parts, which had already arrived in Britain by sea, for American vehicles and aircraft being used by the Eighth Army. The airlift would have speeded up delivery immensely. The BOAC aircraft may have been bringing in the cargo for the Middle East from the USA on their transatlantic flights — in July 1942 the BOAC Ferry Return Service made 23 trips eastbound to Prestwick over the North Atlantic, carrying a total of 46,693lb (21,180kg) of freight to Britain — or the cargo could have included urgently needed equipment and materiel from British manufacturers.

Dill told Marshall on July 30 that Middle East Command was very pleased with the 15,000 rounds already delivered and the 5,000

rounds contributed by the USA's Air Transport Command. There were still four or five loads (4–5,000 rounds) in transit at the time. At the end of July RAF Ferry Command logged: “We have a message of appreciation from Army Headquarters in the Middle East on the assistance rendered by the carriage of the ammunition”.¹⁸

During the period of the two airlifts the pressure eased. Deane explained to Dill on July 18 that contact had been lost with one of the American aircraft in Africa; “900 to 1,000 rounds of this ammunition were on an aircraft which has been lost in Africa. The ‘plane has not been heard from and it is not known what happened to it”. This was probably a Douglas C-47 used for part of the route across Africa. Deane offered to ship a further 1,000 rounds which would not get to Cairo before July 25 or 26. But, he said, “it is doubtful if it will be worthwhile further reducing shipments of much-needed aircraft parts to replace the lost ammunition” and by July 20, Dill could agree that, having checked with Middle East Command, the loss was not a problem. Liberator AL512 had left for Prestwick on July 21; “as so much freight had been moved, its services were no longer required”.¹⁹

A REVERSAL OF FORTUNE

By July 18 the situation was changing on the ground. Auchinleck had come to the conclusion that the enemy was in a bad way, which took some of the urgency out of the resupply mission. The Germans and Italians were having their own desperate problems with supplies. Auchinleck's view is backed by German sources which suggest



AM920 was one of the batch of 20 LB-30Bs diverted from the US Army Air Corps to the RAF after the fall of France, delivered between April and August 1941. One of three operated by BOAC on the transatlantic service, AM920 went on to become G-AHYB after the war, before being sold in 1950 to become a VIP transport in French Indo-China as F-VNPN, as covered in Fit For The King in TAH6.

PHILIP JARRETT COLLECTION

that by July 21, German and Italian forces had lost most of their field artillery and half of their anti-tank guns. The Germans had only 42 tanks fit for combat and the Italians only about 50.²⁰

There was — quite reasonably — a difference between the appreciation of the situation at the beginning of July, when the gap in deliveries loomed large and rapid resupply was of paramount importance, and the more considered analysis which could come later with the benefit of better intelligence. Command decisions, including the setting up of the airlifts, had to be made with the information available at the time.

What we must marvel at is the speed of the response to the crisis believed to be emerging at the beginning of July, and the planning and execution of the two airlift operations across vast distances against a very tight deadline. This resupply could not have been fulfilled in any other way. At the very least the airlift provided a cushion of ammunition and other urgent supplies which bolstered resources in the other battles during

August to hold the line. It remains a remarkable example of the much undervalued contribution that air transport made to the winning of the war, the skill and endurance of the pilots and crews and the durability of the Liberator.

SUPERIORITY IN QUANTITY AND QUALITY

At the end of August 1942 the impact of the strategic decisions taken at the face-to-face meetings in Washington could at last be felt. The equipment began to arrive and the Allies commenced a build-up of forces during September. With the arrival of additional armoured divisions, more Grant tanks, the Sherman tanks and self-propelled artillery agreed in Washington and the replacement of the two-pounder anti-tank gun by the six-pounder, the British and Commonwealth forces began to outweigh the Germans in quality and quantity. It was possible to prepare for the second battle at El Alamein when, under Montgomery's new leadership, at the end of October, the tide really began to turn.

LB-30A AM259 has its engines run up at La Guardia Field in New York on February 19, 1941, after its 2,700-mile flight from the Consolidated factory at San Diego. This was one of the Liberators used to fly the northern route to Cairo via Gibraltar during the 1942 Middle East airlifts, after which it joined BOAC as G-AGCD in August 1942.

BOB LIVINGSTONE COLLECTION



The response to the crisis in the Middle East arising from the fall of Tobruk, the British retreat and the threat to Egypt, illustrates the way the Allies used their developing air transport capacity to support co-operative decision-making, and to take collaborative action involving, at this time, the USA and Britain.

The rapid response from America and the agreement to divert tanks and ammunition from American forces to British and Commonwealth forces in the Middle East provides a good example of speedy decision-making by political leaders in face-to-face meetings only made possible by the use of air transport. These were decisions built on a background of a developing relationship at various levels, all supported by the Allies' air transport.

But what is also clear is that almost 90 tons of additional urgently needed war supplies for the Eighth Army were rushed to the Middle East by air in the crucial weeks in July 1942 before the reinforcements agreed in Washington could be delivered. This vital air cargo, including more than 20,000 rounds of 37mm tank ammunition, helped to fill the desperate gap in the supply of ammunition and spares identified by Field Marshal Sir John Dill at the beginning of July, and strengthened the ability of the Eighth Army to hold back Rommel and his Afrika Korps at a crucial time.



ABOVE General Bernard Montgomery surveys the battlefield from a Grant tank during the Second Battle of El Alamein in October–November 1942. With the Allied forces resupplied thanks to the heroic efforts made by air transport crews, the battle marked a decisive victory for the Allies in the Western Desert.

ACKNOWLEDGMENTS The Aviation Historian would like to thank Bob Livingstone and Colin Higgs for their invaluable help with the preparation of this feature

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- 17 See entry for July 12, 1942, Operations Record Book of No 44 Group in TNA/PRO AIR 25/625 and Air Movement Order 19/42 in Appendices to the Operations Record Book in TNA/PRO AIR 25/629
- 18 Ferry Command Traffic Summary for July 1942, op cit
- 19 See entry for July 13, 1942, No 1425 Flight's Operations Record Book, TNA/PRO AIR 29/868
- 20 Maj-Gen I.S.O. Playfair, *History of the Second World War — The Mediterranean and Middle East Vol III: British Fortunes Reach Their Lowest Ebb* (Naval & Military Press, 2004) p353



The Shah's Skyhooks



When we published our history of the Cessna CH-1 Skyhook helicopter in *TAH3*, little was known about the type's brief career in Iran. To complete the story, Iranian aviation specialist **BABAK TAGHVAEE** spoke to the country's first rotary-wing pilot, **COLONEL GHOLAM-REZA RAHBARIYAN**, who recalls his training in America and how Cessna's sole venture into the helicopter market performed in pre-revolution Iran



MAIN PICTURE 1st Lt Gholam-Reza Rahbariyan (furtherest left) helps unload supplies from Cessna UH-41A "201" during a Red Lion and Sun Society flood-relief operation at Gorgan and Gonbad-e Kavus in 1964. **TOP RIGHT** An official IIGAU portrait of Gholam-Reza Rahbariyan taken in the 1960s.

IN 1958 THE establishment of an aviation unit for the Imperial Iranian Gendarmerie (IIG) was put in place by the government of Iran, under the leadership of Mohammad-Reza Shah Pahlavi — the Shah. At that time the IIG played an important role in the protection of Iran's borders, as well as providing domestic security alongside the *Shahrbani* (police) and other security forces.

The first objective of the aviation unit was to be its use for observation, surveillance, counter-drug-trafficking, the chasing and tracking of bandits back to their hideouts, as well as performing the liaison role in the mountain and desert regions of the country. Before merging with the IIG in 1958, the Road Police, Jungle Guard, Customs Guard, Border Guard and drug enforcement and military service organisations had called on the Imperial Iranian Air Force (IIAF) to perform surveillance sorties with a de Havilland Canada L-20B Beaver.

A year after official approval of the plan, the Imperial Iranian Gendarmerie Aviation Unit (IIGAU) was formed with former IIAF technicians, pilots and a sole L-20B Beaver at Ghale-Morghi airport, near Tehran. Volunteers for the new service were sent to the USA to train as pilots and technicians in 1959.

In 1961 a group of IIGAU pilots became the first to be sent to America for helicopter training, although only one of them fully completed the training and returned to Iran in 1962, by which time five Cessna UH-41A Skyhooks had been delivered to the IIGAU from America under the provisions of the Military Assistance Program (MAP).



TAH ARCHIVE

ABOVE Cessna's sole venture into the rotary-wing market, the CH-1 Skyhook was conceived as a predominantly civil four-seat aircraft capable of delivering businessmen into the heart of the city. Ten examples entered service with the US Army as the YH-41 Seneca during 1957–58; the Iranian MAP examples were designated as UH-41As.

In 1962 the American government purchased 15 military variants of the Cessna CH-1C Skyhook helicopter for use with its MAP commitments, under which selected countries would be provided with military equipment in the hope that they would act as bulwarks against the global spread of communism. Six of the Skyhooks were sent to the Ecuadorian Air Force, five went to the IIGAU, which planned to use the unusual helicopters in the air ambulance and medical evacuation (medevac) roles; two were delivered to Peru and the last two remained with the US Army for pilot-training purposes.

The Skyhooks were not the first Iranian helicopters to see service, but their pilots were the first to be Iranian nationals. Before the Skyhooks had been delivered, Iran's Ministry of Security had acquired a pair of Westland-Sikorsky WS-55A Whirlwind IIs, along with a group of pilots hired from British helicopter services company Bristow. The two Whirlwinds were later transferred to the IIAF for use in the VIP transport role. As a result, a group of IIAF pilots was sent to the UK for helicopter training.

The Skyhooks received serial numbers 201–205 on their delivery to the IIGAU. Four were equipped with a standard skid undercarriage and one (205) was fitted with twin floats for operations from water. All were fitted with a 270 h.p. horizontally-opposed six-cylinder Continental FSO-526-6 piston engine. The Cessna helicopters served with the IIGAU for a relatively short period; the last three were retired

in 1968 and stored in an Iranian Gendarmerie junkyard on the north-east side of Mehrabad International Airport in Tehran. The IIGAU subsequently acquired four Bell UH-1Hs and 14 Agusta-Bell 206A JetRangers from the USA and Italy respectively.

IRAN'S FIRST HELICOPTER PILOT

In mid-2014 the author conducted an exclusive interview with the first Iranian helicopter pilot, Colonel Gholam-Reza Rahbariyan. We present the interview here in its entirety.

How did you become involved with the Iranian Gendarmerie?

"I was born in Qazvin in 1937. I got my diploma in 1957, and, because of my interest in teaching, I was employed at the Iranian Ministry of Education. I spent a year on a teacher-training course at the Ministry's university. After completion of the course, I had to do two years' military service in one of the military forces in order to be permitted to work as a teacher.

"I went to Tehran and heard that the Customs Guard was hiring personnel. I calculated that this would have some benefit for me, as I would have an income, at the same time as increasing my knowledge on the Guard's training courses. In addition, I could work for the Guard for a year instead of a hard two-year military service period in the Gendarmerie. I was posted to the Customs Guard at the Gendarmerie's Saltanat-



ABOVE Gholam-Reza Rahbariyan at the controls of a Hiller H-23D Raven during training at Camp Wolters in Texas in 1961. The US Army Primary Helicopter School was run by Southern Airways, which was responsible for rotary-wing flight training from classroom to certification, as well as the maintenance of the school's Army helicopters.

Abad base in Tehran. In the event, when I arrived at the Customs Guard, it was being merged with the Gendarmerie, along with the various other military service organisations, in October 1958. Therefore I went to the IIG HQ at 24 Esfand Square, at the top of South Amir-Abad street in Tehran.

"Because of the high grades I had achieved at the university and during my training classes with the IIG, I was posted to Gendarmerie HQ and its Office of Personnel Promotion. I evaluated personnel service records and made recommendations for promotions."

How did you become Iran's first helicopter pilot?

"I passed an examination after completing an English-language training course at the Iran-America Society English Language School, and planned to go back to university. Unexpectedly, however, a directive was issued by the Gendarmerie that offered English-speaking personnel the chance to apply for a pilot-training course in the USA, subject to passing various medical tests. I passed the medical exam in November 1960, before spending a few weeks at the Iranian Army's English-language school above Tehran's Post Centre. In the middle of the course we were informed by the IIG that we could start flight instruction, to keep to the training schedule.

"My first flights were in the Austers of the Iranian Civil Aviation Club at Doshan-Tappeh



ABOVE Rahbariyan poses proudly with a US Army Sikorsky H-19D at Fort Rucker, Alabama, where he moved after having completed his primary helicopter training course at Camp Wolters in August 1962. Rahbariyan was the only Iranian on the course at Fort Rucker, and was asked to stay on as an instructor.



ABOVE The certificate awarded to Gholam-Reza Rahbaryan on his completion of the US Army Primary Helicopter School's Officer Rotary Wing Aviator Course on August 10, 1962. **LEFT** Rahbaryan in the map room of the Imperial Iranian Gendarmerie Aviation Unit at Ghale-Morgh, holding a photograph of a Skyhook before the MAP delivery.

airfield in Tehran. [The club operated 15 Auster J/5 Aiglets, registered EP-AIA to EP-AIJ, from the early 1950s — Ed.] My flight instructor was an IIAF pilot, Major Hashemi-Nejad, and after 10hr in the Austers I was to prepare for the helicopter training course.

"Several days later I flew in a Pan Am DC-6 from Tehran to Rhein-Main [in Germany], where I boarded a USAF C-54A to McGuire AFB in New Jersey. There I boarded another USAF transport to Randolph AFB in Texas. During the one-day stop at Frankfurt, some of my fellow students took a trip into the city and didn't make it back in time to catch the transatlantic flight. They arrived in the USA 48hr later and had to pay a fine!

"We had further English-language training at Lackland AFB in San Antonio, Texas. I was one of only two Iranian pilot students there. After several weeks my classmate, Mr Yusefi, didn't pass the course and I became the sole Gendarmerie student pilot. The other Iranian students were maintenance men.

"I completed the six-month English-language training course at Lackland in four months, and was sent for helicopter pilot training at Camp Wolters in Texas, where I flew US Army Hiller H-23D Ravens. My instructor also permitted me to fly eight other helicopter types which were on the base during training, for familiarisation purposes, although I am fairly certain that it was officially forbidden for me to fly those other types. After four months I had logged 80hr on H-23s, and, on August 10, 1961, I received my helicopter authorisation."

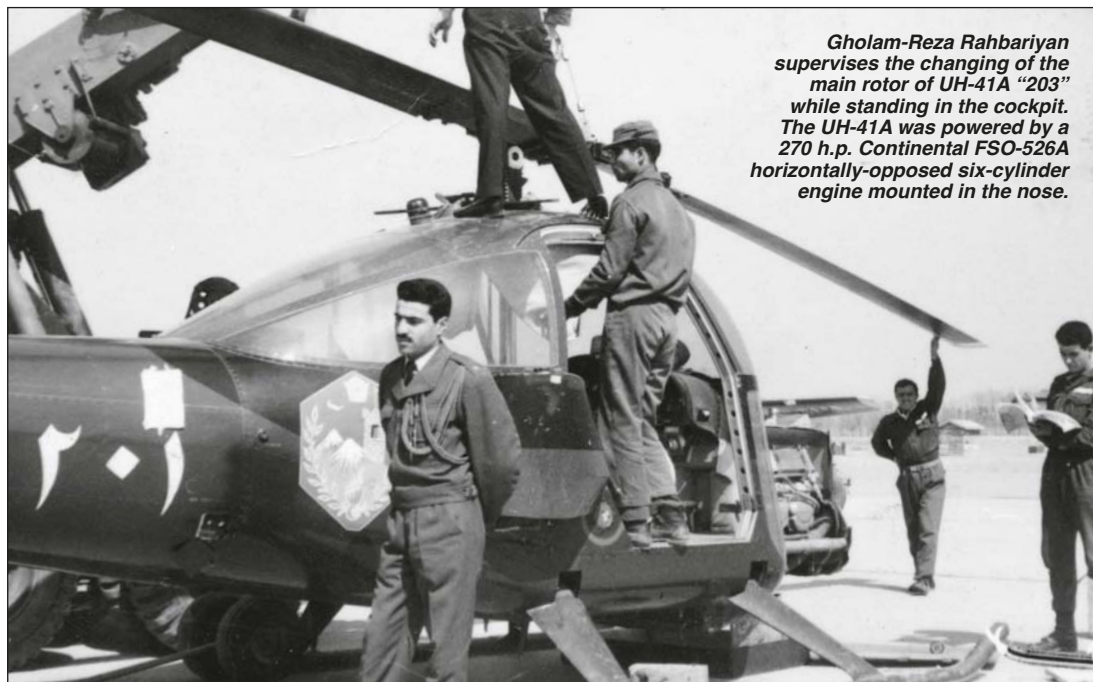
Were there any accidents or mishaps you remember from your training course?

"There were no serious accidents with the H-23D; my instructor was a highly experienced pilot and the Raven was a stable but also very manoeuvrable helicopter.

"I did have a minor accident when my instructor, Mr Clemens, and I were practising touch-and-goes in and out of a small area deep inside a tall pine forest. The landing area was in the shape of a right-angled triangle, and I had to descend and land along its hypotenuse. The area was small and cut deep into the tall pines, but its dimensions had been carefully calculated for our training. If I failed to apply enough thrust, there was a danger of colliding with the trees along the hypotenuse, but if I applied excess thrust and gathered too much forward speed I ran the risk of running into the trees on the other side of the triangle. I carefully descended into the landing area, but for the take-off I wasn't so careful and the tail rotor hit a tree. On return to the air base Clemens gave me a red card."

Could you tell us about your training flights with the Sikorsky H-19D?

"After completing my H-23D training at Camp Wolters, I was sent to Fort Rucker [in Alabama] for a 120hr flight-training course on the H-19D. There were 54 students on the course; I was the only Iranian, although there were two Mexican pilots and some from Spain too. On completion of the course, I was asked by the US Army if I



Gholam-Reza Rahbariyan supervises the changing of the main rotor of UH-41A "203" while standing in the cockpit. The UH-41A was powered by a 270 h.p. Continental FSO-526A horizontally-opposed six-cylinder engine mounted in the nose.

would consider remaining there to become an instructor for the next batch of Iranian helicopter pilots to come to Fort Rucker for training. It was a good offer with good income for me, but I didn't want to be that far from home; so I declined the offer and returned to Iran."

How long after your return to Iran did you become involved with the Cessna helicopter?

"On my return to Iran I was promoted 1st Lieutenant and posted to the IIGAU base on the west side of Ghale-Morghi airport, where there were some old aircraft hangars that dated back to the German era of the 1920s. One of the hangars was used by the American Military Assistance Advisory Group [MAAG] for the

maintenance and repair of its light aircraft. Later, the hangars were restored and new buildings were constructed for the IIGAU base.

"Two flight instructors from Cessna came to Iran along with the helicopters. One of them was Jack Martin, who was a fixed- and rotary-wing pilot, but I can't remember the name of the other Cessna instructor pilot, who was a pure helicopter pilot. They were tasked to test-fly the helicopters and convert me to the Skyhook.

"Jack Martin demanded that the IIGAU have full authority for operations with its helicopters. The Gendarmerie's commander-in-chief at the time was Lt-Gen Mozzafar Malek, an extremely knowledgeable and committed commander, for whom I had a lot of respect. The other high-ranking Gendarmerie officer was

1st Lt Rahbariyan (right) and a Gendarmerie colleague during Red Lion and Sun Society flood-relief operations in 1964. The Skyhook was the first helicopter to be certificated for flying under Instrument Flight Rules (IFR) conditions, although the IIGAU UH-41As were seldom called on to do so.





ABOVE The majority of the photographs from Col Rahbariyan's personal albums accompanying this feature are previously unpublished, images of the float-equipped IIGAU UH-41A having been particularly elusive up until now. Only one IIGAU example, "205", was fitted with the floats, which must have considerably degraded performance.

Maj Bahman Bagheri, a former IIAF pilot.

"Jack requested more time for my transition to the UH-41A, prompting Malek to ask Bagheri the reason why. Ultimately, because of Malek's complaints about delays in getting the helicopters flying during the Fars Insurgency, I performed my first solo Skyhook flight in front of the Gendarmerie commanders during a ceremony at Ghale-Morghhi airport. The following day I flew to Shiraz in a UH-41A to participate in the Gendarmerie's counter-insurgency mission there."

What can you tell us about UH-41A accidents?

"We had a few accidents but the damage was usually repairable. In two cases, however, the helicopters had to be withdrawn from service.

"In one of them, a pilot named Aryapart, one of the second batch of UH-41A pilots, had an accident with '203' on a wintry day. The tailboom separated and it wasn't repairable, so they had to withdraw the helicopter from use. I experienced an incident with '201' during the Iran-Iraq border clashes of 1965, when I was carrying General Malek, whom the Shah had ordered to visit and observe the conflict zone.

"While I was attempting to land on the edge of a precipice at Dejveh, near the Champaran region in the border area of Ilam province, the Cessna's main rotorshaft broke. We hit the ground, but there was no damage. We were literally teetering

on the edge of the precipice. I told Malek to stay inside the helicopter to maintain the balance, then I climbed out and moored the tail of the helicopter to a tree with a rope. Three days later IIGAU technicians replaced the main rotorshaft and I flew back to Shiraz."

Could you tell us a bit about the groundcrew?

"When the IIGAU was established in 1958, ten IIAF technicians joined the new force. Five of them were helicopter specialists and the other five were fixed-wing technicians. Half of them were trained in the USA and the other half received on-the-job training from Jack Martin. Jack was test pilot, instructor and also chief engineer for the UH-41As. He assembled the first batch of Skyhooks when they were delivered to Ghale-Morghhi."

How was the UH-41A in terms of performance and maintenance?

"The helicopters were delivered to Iran with an adequate amount of spares, including two main rotors, so we were never short of spares. Also, because of the type's short service life in the IIGAU [only five years], the lifetime of the airframes was never exceeded and they never required major overhauls.

"The UH-41As had good, reliable engines, but they were not suitable for long-range or long-



ABOVE *Rahbaryan (using microphone) provides instructions during an Imperial Iranian Gendarmerie Aviation Unit exercise at Ghale-Morghi in 1965 or 1966. The military airfield at Ghale-Morghi in the centre of Tehran has not been in use for some time and since the spring of 2011 has been the site of Velayat Park, a leisure development.*

endurance sorties, or flights over mountainous territory, because the engine didn't have adequate horsepower for those high elevations. The maximum altitude I reached in a Skyhook was 12,000ft [3,650m]; at that altitude the supercharger was working hard to keep the engine working properly, despite the r.p.m. dropping steadily.

"The UH-41A had very restricted manoeuvrability. We weren't able to bank more than 45°. Its gearbox was located beneath the cabin floor just above the internal fuel tank and because of that the cabin was extremely noisy."

What do you remember about the other Cessna helicopter pilots of the IIGAU?

"For 18 months after the initial delivery of the UH-41As, Jack Martin and I were the only helicopter pilots of the IIGAU, although there were five Skyhooks in service. After my training trip to the USA, another group of pilots was sent to America to train to become Cessna U-17A pilots for the IIGAU. As part of their primary training courses they completed a 60hr rotary-wing conversion course.

"There were eight of them, including Nematollahi, who has since died; Davari who is still with us but I don't know where he is now; Ghodrat and Aryapart were later killed in an Iranian Helicopter Services Aérospatiale Alouette III while taking off from an oil rig in the Persian Gulf in



ABOVE *Gholam-Reza Rahbaryan (centre) beside one of the UH-41As with a Dutch royal reporter (right) and photographer at Shiraz, the capital of the Fars Province, during a visit to the ruins at Persepolis by Princess Beatrix of The Netherlands in October 1963.*

1988; Ghavami was 'washed out' and became a technician; Ahmad Heydari is still alive and living in the Gendarmerie town at Tehran; Heshmat Tabesh is living at Isfahan. Unfortunately Afarin-Kousha was killed during an accident."

What happened?

"During the Fars Insurgency of 1964–65, three



ABOVE Hamid Bayat (right) was the IIGAU chief mechanic and is seen here with one of the UH-41As at Shiraz Airport in 1967. In the background is a Douglas C-47 of Iranian airline Air Taxi Co, which began operations in 1958, becoming part of Pars Air in 1970 before the company's name was changed to Iran-Aseman Airlines in 1980.

UH-41As were deployed to Shiraz. I was flying as No 1, Tabesh was flying No 2 and Afarin-Kousha was No 3 with Lt-Gen Malek aboard. I located our landing spot and we all set down, me last. Hundreds of people were there to welcome Malek.

"Afarin-Kousha and Malek were the only occupants of the third helicopter. To keep people a safe distance from the Skyhook, Afarin-Kousha locked the cyclic and collective controls and got out of the helicopter to warn people about the overhead rotors. While opening the door for Malek, however, the helicopter unexpectedly jumped and spun through 90°, the main rotor striking the pilot's head and hand. I quickly ran towards him, and with the help of the locals, we put him and his severed hand inside a blanket. I bandaged his head and put him aboard my helicopter to get him to the Gachsaran hospital, but he was dead before we got there.

"I remember another similar accident around 1965 or 1966, when I was ordered to carry the governor of Fars province from Shiraz to a newly established sugar factory near Fesa. After landing at Fesa I got out of the helicopter to guide the governor, Mr Pirniya, away from the helicopter. At that moment a high-ranking security officer ran toward us and straight into the spinning tail rotor of the Cessna. I bandaged his head and called the IIG in Shiraz to send an aircraft to carry him to hospital. A [Cessna] U-17A Skywagon arrived shortly

afterwards and took him to hospital. I went to visit him that night and he was in surprisingly good shape.

"Another incident occurred while I was instructing on the Skyhook. We were practising procedures such as auto-rotation and emergency landings into confined spaces. During one of the training flights at Ghale-Morghi in 1968, I was the instructor and Saedi, one of the second batch of helicopter pilots, was my student. During the flight the cylinder-head temperature increased, smoke started to pour out of the engine and the main rotorshaft broke; suddenly we had to perform a real emergency landing!"

Did the Cessna helicopters participate in the flood-relief operations of the period?

"Yes. On the first occasion a UH-41A was deployed to Buin Zahra near Qazvin after the earthquake in September 1962. The Shah was aboard on that flight. Also, during the Quchan flood of 1965 or 1966, one of the UH-41As was deployed to Mashhad to carry relief aid into Quchan. On another occasion, during the floods at Gorgan and Gonbad-e Kavus, I flew relief flights in '201' to the flood areas for the Red Lion and Sun Society [an Iranian organisation similar to the Red Cross/Red Crescent — Ed.]

When and how were the Cessna helicopters finally withdrawn from service?



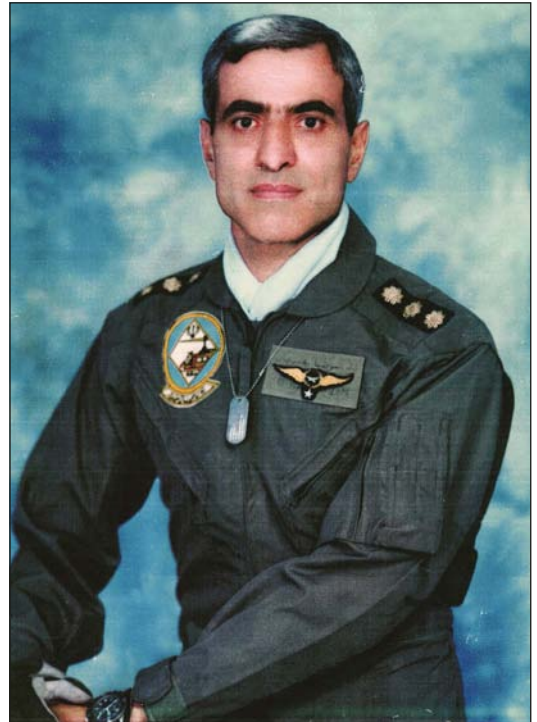
ABOVE Following the retirement of the IIGAU's UH-41As, Gholam-Reza Rahbariyan went on to fly Agusta-Bell 206 JetRangers and Bell UH-1Hs for the Gendarmerie. From having only one rotary-wing pilot at the beginning of the 1960s, Iran now makes great use of helicopters, such as these Iranian Police Aviation Bell UH-1H and UH-1Ns.

"In 1968 an IIG commission determined that the UH-41As did not have adequate performance for Iran's climate or IIGAU missions. In addition, Cessna was unable to supply spare parts for the helicopters [production of the Skyhook had stopped in 1963 — Ed.] At the same time, the Iranian Ministry of War ordered 100 Agusta-Bell 205s and 206s from Italy, and some of these were to be operated by the IIGAU.

"Three of the UH-41As were withdrawn from use before the type's official retirement, the last of the three being '202', which was written off in an accident. We were on a mission to collect weapons from Iranian nomads near Shiraz when the gearbox locked and broke. After an emergency landing we transported the helicopter to Tehran by road. Jack Martin evaluated the damage and told us that Cessna was not able to provide a replacement gearbox. The machine was withdrawn from use and put in one of our hangars beside '203' and another damaged helicopter at Ghale-Morghi.

"After the official retirement of the helicopters, their rotors were removed and they were put in the IIGAU junkyard on the Makhsus road in North Mehrabad. I don't know what happened to them after that. I converted to the Agusta-Bell 206 and, later, the UH-1H at Isfahan. I remained in the IIGAU through the 1979 revolution, and continued to serve until 1988, when I retired."

Colonel Gholam-Reza Rahbariyan, thank you.



ABOVE Colonel Gholam-Reza Rahbariyan when he was a Bell UH-1H pilot in the early 1980s. After the 1979 revolution the Gendarmerie lost much of its power, and by 1990 had been incorporated into the Security Forces of the Islamic Republic of Iran.



The Story of America's Supplemental Airlines Against All Odds

Award-winning American civil aviation specialist **DAVID H. STRINGER** concludes his two-part series on the USA's post-war non-scheduled airlines — or “non-skeds” — with the continuing story of their frustrating battle with the Civil Aeronautics Board, which, while having the best of intentions, was determined to see them put out of business

“THE AVAILABILITY TO the military air services of commercial transport-type aircraft in as large numbers as possible to serve as auxiliary military airlift is essential. These aircraft should be in commercial service in order that this auxiliary airlift may not be a burden upon the national defense budget in time of peace.”

The above statement, issued by the Aviation Policy Board of the US Congress in 1948, was the root of the reprieve that kept some large irregular carriers alive despite the not-so-clandestine efforts of the Civil Aeronautics Board (CAB) to put them all out of business. Many of the USA's non-scheduled supplemental airlines — or “non-skeds” — had folded or gone bankrupt as a result of trying to follow the CAB's complex rules governing their existence. But the stronger among them managed to survive and show their worth by ferrying supplies to the USAF's staging points during the Berlin Airlift of 1948–49.

On the heels of that success came the Korean conflict, which kept American personnel and materiel crossing the Pacific Ocean *en masse* for the next three years (June 1950 to July 1953).

Commercial operators were not allowed within the war zone, so the non-skeds flew their missions between the USA and Japan, where the Military Air Transport Service (MATS) took over, transporting personnel and supplies on to Korea. During the conflict one of the irregulars, Transocean Airlines (see page 113), carried 9,960,095 tons of cargo and 20,000 passengers across the Pacific in support of the military, in addition to bringing 7,112 stretcher patients back to the USA. Overseas National Airways, another irregular operator, kept its entire fleet of four Douglas DC-4s in constant rotation between the USA, primarily Travis Air Force Base in California, and Japan, transporting troops and cargo. At final tally, the non-certificated carriers had provided some 50 per cent of the lift over the course of the war.

The wake of the Goodkind memo

Concurrent with Drew Pearson's 1953 exposé of the 1948 Goodkind Memorandum, in which CAB employee Louis Goodkind outlined the steps the Board could take “legally” to put all of the large irregular carriers out of business, the US Senate's Select Committee on Small Business held hearings to determine the future of irregular airlines in the

USA's air transport industry. It was the second time that Congress had met with airline executives from both certificated (scheduled) and non-certificated airlines to give them a chance to voice their opinions. Foremost on the agenda, as far as the Select Committee was concerned, was why a government agency (the CAB) would be trying to annihilate an entire group of air transport companies that the American military had declared essential to its needs.

The answer was that the CAB believed that the certificated airlines could handle all of the needs of the military and fill the desire of the public for air-coach and charter services themselves. The certificated scheduled airlines represented order, regulated by the Board. In the view of the CAB, the non-scheduled airlines represented unregulated chaos. Naturally, the certificated airlines would be happy to see this sector of the industry, which they saw as stealing passengers away from them, completely eliminated.

The reality was that the scheduled airlines could not fully meet the needs of the military during emergencies without disrupting their own commercial traffic. In addition, the air-coach concept had been created and developed by the non-skeds and not by the certificated carriers, most of which dragged their feet when it appeared that they would have to establish their own coach services. Late in 1951 the CAB had to force United Air Lines and TWA to inaugurate transcontinental coach services between San Francisco and the East Coast, because the lack of any such service by a certificated carrier embarrassed the CAB, which had declared that the scheduled airlines were accommodating the needs of all passengers seeking coach-class travel.

The representatives of the non-certificated carriers continually impressed upon Congress the fact that none of them received one penny of government aid, a fact that should have brought discomfort to the executives of the subsidy-reliant scheduled airlines.

You can't fly every Sunday

The rules that the CAB created in order to regulate the large irregular carriers out of business were truly draconian. First, there was the limitation on the number of flights allowed per month between any two points, which varied from case to case but was never more than 12. There could be no



FACING PAGE It was rare for a “non-sked” to spend precious resources on promotional material, but this attractive artist's impression shows a pair of Douglas DC-6As of Overseas National Airways (ONA) at a bustling airport. The airline was one of the few that survived all of the CAB's “shake-outs” of the supplemental industry.



ABOVE One of several irregular carriers which existed specifically for the purpose of transporting gamblers to casinos was Phenix Airlines, about which little is known, but which may have served Phenix City, Alabama, a 1950s nightlife hotspot. Note how the playing cards on the fin of this leased Curtiss C-46 match the N95445 registration.

implication of regularity in those flights. If a non-sked operated four flights a month between two points but those flights took place every Sunday, the Board could prosecute the carrier for operating a regular service. Even if the flights operated every fourth day — meaning that they would not operate on the same days of the week each week — the Board declared that such an operation was illegal because the flights operated at regularly occurring intervals and, thus, it was not an irregular operation.

Although it was common practice for several non-skeds to band together under the banner of a single ticketing agency, the CAB ruled this practice illegal. Thus, if one carrier operated between Los Angeles and New York only four times per month on different days each week, that carrier could be prosecuted for being in a ticketing relationship with another carrier also operating between those two cities when the carriers' combined flights resembled a regular operation. Likewise, the Board outlawed the issuing of exchange orders by non-certificated

airlines or their agents. These orders allowed tickets sold by one carrier to be endorsed and accepted for transport by another. This was common practice among the non-skeds until the CAB clamped down.

The orders banning regular or frequent service were aimed at breaking the route operations of the large irregular carriers altogether. Any airline operating transport aircraft over selected routes needs to establish some kind of regularity and reliability, even if it is in concert with other operators, in order to attract customers. And provisions for aircraft maintenance, crew changes and other regular facets of airline operation have to be organised. The Board's rules frustrated the non-skeds at every turn.

Having decreed that every large irregular carrier must petition the Board for a Certificate of Public Convenience & Necessity (which the CAB would then not approve), or for registration to continue operating as a non-certificated airline, the Board dragged out these proceedings, often telling the representatives of the carriers, after

The list of successful supplemental airlines included Johnson Flying Service of Missoula, Montana, where DC-3 N24320 is seen here in 1965. In addition to regular charter operations, Johnson was famous for providing firefighting support for the US Forest Service; its fleet included two Ford Tri-Motors and a DC-2 for "smoke jumper" operations.

PETER KEATING © A FLYING HISTORY LTD



North American Airlines: the thorn in the CAB's side

AIRLINE HISTORIAN R.E.G. Davies claimed that Stanley Weiss was the first person to operate an air-coach flight, on January 17, 1946, when his Douglas DC-3, full of veterans returning home from the war, lifted off from the runway at Long Beach, California, bound for Kansas City, Chicago and New York. Davies's claim may be hard to verify but one thing is certain — Weiss played a significant role at the very beginning of the air coach phenomenon.

Weiss and his business partner, Col Charles Sherman, had formed Fireball Air Express the previous month with the intent of flying cargo on contract. When they realised that there was money to be made flying GIs home, they decided to fly people instead of freight. Prudently changing the name of the company to Standard Air Lines in 1946, Weiss and his new business partner, James Fischgrund, began charging a low one-way fare of \$99 coast-to-coast.

A competing irregular air-coach carrier, Viking Air Lines, was charging the same fare over the same route. Weiss and Fischgrund came to terms with Viking's leaders, Ross Hart and Jack Lewin, merging the two companies in 1949 in order to create a stronger airline but retaining the two separate operating licences. The partners then founded the North American Airlines Agency and acquired the licences of four more large irregular carriers — 20th Century Airlines, Trans-American Airways, Trans-National Airlines and Hemisphere Air Transport. Several flights per month, operated under each separate licence, allowed the consortium to offer a regular service under the banner of North American, circumventing the CAB's restrictive rules which limited the number of monthly schedules permitted by one licence-holder between any two points. In 1949 the North American fleet consisted of 14 DC-3s and a DC-4.

The CAB was not pleased and tried repeatedly to put the operation out of business. But Weiss fought back. Called "The Ninety-Niner", in reference to the fare, North American's flights were fully loaded with passengers who could not afford, or would not pay, the certificated airlines' high fares. North American made money even though it did not receive pay for flying the mail or receive subsidy payments from the government. After the Congressional investigations of 1951 and 1953, during which the legislative body chastised the CAB for trying to put the large irregular carriers out of business, the Board temporarily backed off from its harassment of North American.

By 1954, with more DC-4s in the fleet, Weiss's popular conglomerate was carrying just short of 200,000 passengers per year. North American Airlines tried to enter the ranks of the fully-certificated scheduled carriers by applying for routes in the Denver Service Case and, later, applying for transatlantic scheduled air-coach authority. The CAB denied the organisation's applications every time, but unlike smaller, cash-strapped non-skeds, North American could afford the attorneys' and clerks' fees necessary to take on the Board in person in Washington DC.

"If Weiss has the money, sell him the airplanes . . ."

After the CAB thwarted North American's first attempt to buy DC-6s early on, the company placed a second order, in 1954, for seven examples of the more-advanced DC-6B. According to Davies, Donald Douglas Sr told his salesman, "If Stan Weiss has the money, you sell him the airplanes". The certificated carriers were not pleased when North American put its 102-seat pressurised DC-6Bs into service on the transcontinental route, effective from May 1, 1955, offering an even lower fare of \$88 one-way. Although the CAB's attitude toward the supplementals appeared to have softened by late 1955, the Board had had enough of Weiss's operation and its flagrant disregard for the CAB's rulings. North American's resounding success was an embarrassment to the Board, which revoked all of Weiss's licences on July 1, 1955, citing serious and wilful violations of the CAB's economic regulations. Appeals through the court system allowed the company to live while it continued to apply for certificated routes, much to the consternation of the CAB. North American's passenger count for 1955 approached 275,000.

Aircraft manufacturer North American Aviation filed a suit claiming that North American Airlines could not trade under a name so similar to its own, and the US Circuit Court of Appeals agreed. On May 12, 1956, North American Airlines was forced to officially change its name to Trans American Airlines (TAA). The new company continued to operate while its conflict with the CAB played itself out within the judicial system. Stan Weiss lost the battle and Trans American Airlines ceased operations on January 19, 1957. His company had been too popular and too much of a threat to the regulated industry.

DHS

Douglas DC-4 N63396 (c/n 10486) in North American Airlines livery, although it was registered to 20th Century Airlines, part of the North American Airlines Agency. In April 1957 it went to Reeve Aleutian Airways, with which it was serving when it crashed at Great Sitkin Isle in the Aleutians, killing 16, in September 1959.





ABOVE American Air Export & Import Co received a temporary CAB certificate to operate scheduled cargo services as Aaxico Airlines in 1957, the irregular carrier thus joining the ranks of the USA's certificated airlines. Note the "Route 121 Airfreight Mail Express" on the fin of this C-46, denoting the airline's eligibility to carry mail.

weeks of testimony, that they would have to return to present their arguments in yet another case. The Board knew that the cash-strapped non-skeds could ill-afford the legal fees and other expenses involved in repeated and prolonged appearances before the CAB in Washington DC.

Then there was the issue of aircraft. Because the operation of large transport aircraft requires a great deal of money, the irregular carriers leased some of their Curtiss C-46s and other types for short periods of time. As the Congressional Committee noted, "An operator simply can not afford to take a long-term lease on a large aircraft that he is permitted to fly only four or five times a month between two points". Knowing this, the CAB created a regulation making it unlawful for a non-scheduled airline to operate any aircraft if it did not have a lease or agreement for exclusive use of the aircraft for at least six months.

The Board also thwarted the purchase of newer, more modern airliners, which would have better customer appeal. The North American Airlines group, a consortium of carriers that continuously fought back against the CAB (see page 108), tried to order two factory-fresh pressurised Douglas DC-6s for transcontinental service. The US Air

Co-ordinating Committee, established by President Harry S. Truman, had to approve the allocation of materials to build commercial aircraft. Approval was usually just a formality but North American's request for the two new propliners was denied. One member of the CAB sat on the Air Co-ordinating Committee (at that time it was Oswald Ryan, chairman of the Board). At the insistence of its lone CAB member, the Committee refused to approve the purchase, stating that North American was unable to justify its need for such an aircraft.

Effectively blocked from buying new aircraft, the non-skeds were stuck with fleets of converted C-47s, C-54s and ungainly C-46s, the last-named becoming synonymous with the non-certificated airlines. But the CAB saw to it that acquiring even these outdated aircraft was a difficult process for the large irregular carriers. The USAF leased its surplus C-46s to the non-skeds, who would put their names on a waiting list to secure the aircraft as they became available. When Peninsular Air Transport, a non-certificated carrier, reached the top of the list, the USAF refused to lease any C-46s to the company. The CAB had intervened, asking the air force not to lease to Peninsular

Peninsular Air Transport C-46 N4761C (c/n 30465) had already seen an active life by the time it joined the airline in the early 1950s, having served with the military until 1948, operated in South America and suffered at least two forced landings.

JOHN WEGG COLLECTION VIA AUTHOR





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ABOVE Lockheed L-749A Constellation N4901C (c/n 2671) of Capitol Airways in 1963. The aircraft had served with BOAC as G-ANNT, named Buckingham, from September 1954, Capitol acquiring the elegant airliner in March 1958. It later became an exhibit at the Bradley Air Museum in Connecticut until it was destroyed in a tornado in 1979.

because the carrier was operating too frequently. The same thing happened to Caribbean American Lines, another of the non-skeds.

Now that the CAB had locked the irregular carriers into operating nothing but old aircraft, mostly unattractive C-46 workhorses, and even tried to stifle the acquisition of those, the Board took one more stab at the non-skeds, hoping that it would be fatal. The CAB took the unusual step of issuing a safety regulation, effective January 1, 1952, that substantially reduced the allowable gross take-off weight for C-46s in commercial operation. There was no indication that weight had been a factor in any large irregular carrier C-46 crash up until that time, but the Board issued this measure with the belief that nobody would question an edict which supposedly promoted safety. In their defence, two members of the five-man CAB dissented — Josh Lee and Joseph P. Adams — but the other three voted to pass the regulation. And so it did.

Resilience and resurrection

Just when it appeared that the CAB had finally delivered the *coup de grâce* to the group of upstart airlines that it had branded large irregular carriers, leaving America's skies the province of the Board's regulated, scheduled airlines, the US Senate stepped in and reprimanded the CAB for its handling of the situation. Many of these underdog airlines, derisively called non-skeds, fly-by-nights, or simply irregulars, had certainly proven their worth through service rendered to the military. They had filled the commercial needs of freight-shippers and civilian charter groups in addition to bringing air travel to the masses via the creation of the air-coach concept.

The ultimatum was clear. Instead of trying to kill the non-skeds, the CAB needed to create a place for them among the nation's commercial airlines. The strongest and the scrappiest among

the large irregular carriers had survived and, despite the Board's interference, continued to maintain a thriving business. In 1954 the non-skeds generated 1,252,680,000 revenue passenger miles and 54,249,000 cargo ton miles. They had met the charter needs of the public and the lift demands of the military which the certificated carriers could not accommodate.

The CAB had a different makeup and a different philosophy by the end of 1955. Two of the five members of the Board had been replaced. In an order adopted on December 29, 1955, the CAB stated: "The irregulars represent a significant part of the nation's air transport system and there is a continuing need for their services. They have rendered invaluable service to the military. The growth of the operations of the irregulars has not had an adverse affect upon the certificated carriers. The Board's policy toward these carriers should be directed toward their survival and continued healthy growth, subject to the overall objectives of the Act [the Civil Aeronautics Act of 1938] and a proper relationship to the certificated air carrier system". This was a far cry from the Goodkind Memo of 1948, which had outlined the steps necessary to eliminate the non-skeds.

No longer would they be burdened with the unwieldy title of large irregular carriers, or the less-than-inspiring term, "irregulars". The group was given a new classification. From that point on they would officially be known as America's supplemental airlines.

With all of this new attention came yet another licensing process. But this time the carriers deemed fit, willing and able would receive a Certificate of Public Convenience & Necessity for Supplemental Air Service. The terms of their authority were made clear. Approved carriers could operate commercial and military charters. They could also offer supplemental scheduled services, with a maximum of ten flights per



ABOVE Douglas DC-6A N45500 of World Airways at Oakland, California. Under the guidance of Edward J. Daly, who bought the airline aged 27 in 1950 for \$50,000, World adjusted to the USA's changing airline industry over the years and survived both the CAB's reign and deregulation in 1978. Sadly, the airline ceased operations in 2014.

month in each direction between any two points in the 50 states and the District of Columbia.

A total of 54 companies applied for certification. In January 1957 the CAB's examiners ruled that 31 of the applicants were qualified; 23 were not. When the certificates were finally issued on October 1, 1959, the pool of selected carriers had dwindled by six. There would be 25 supplemental air carriers legally certificated and protected under the law. It seemed that after some 14 years of fighting, the non-skeds were finally going to have their day in the sun.

Clouds on the horizon

That sunny day did not last for long. Almost immediately United Air Lines filed suit against the CAB for overstepping its bounds. How could the Board permit these outfits to fly on a schedule between any cities they pleased up to ten times a month when the scheduled airlines were relegated to flying only their certificated routes? In 1960, the US Court of Appeals in the District of Columbia agreed and the situation was turned over to Congress. The House of Representatives issued a law allowing the supplementals that had

been certificated the previous year to continue operating with "interim authority" while they sorted the situation out.

Congress was once again faced with the question of what to do with the supplemental carriers. And, as if on cue in a play, tragedy struck and an accusing finger was once again pointed at the non-skeds. After several years of safe operations without a single passenger fatality among the supplementals, World Airways DC-6A N90779, carrying military personnel and their dependents, crashed into a mountain after take-off from Guam on September 19, 1960. The accident, in which 80 people lost their lives, was ascribed to pilot error.

Then, on October 29 the same year, the California Polytechnic State University (Cal Poly) football team was set to return from a game in Ohio to its campus in San Luis Obispo. For the trip C-46 N1244N, belonging to supplemental carrier Arctic-Pacific Airlines, was chartered. In zero visibility, the Commando began its take-off run at Toledo Express Airport. The port engine began to lose power just as the aircraft became airborne. According to an article in the *Toledo*

BILL RUSSO COLLECTION VIA AUTHOR

Douglas DC-4 N79999 of United States Overseas Airlines (USOA), an airline renowned for providing safe, reliable charter service to military and civilian groups throughout its existence. The company was penalised for not terminating its scheduled-route operations by the CAB's July 10, 1964, deadline, and was accordingly shut down by the CAB that September.



Transocean Air Lines: “Anything, anywhere, anytime”

ORVIS NELSON WAS a captain for United Air Lines and a vice-president of the Air Line Pilots' Association (ALPA), the American pilots' union. After World War Two he left the security of his job at United to become his own boss by starting a non-scheduled airline. Within a few years, Nelson had built Transocean Air Lines (TAL or TALOA) into the largest of the irregular carriers, engaging some 6,700 employees at 57 bases worldwide during its peak years. With the company motto “We will fly anything, anywhere, anytime”, Nelson built an enviable resumé of service. The airline first established maintenance bases at its headquarters airport in Oakland, California, and in Windsor Locks, Connecticut, later expanding to other locations.

Transocean was contracted to help war-decimated and developing countries establish their new national airlines in the late 1940s and early 1950s. Among these ventures were Japan Air Lines, Philippine Air Lines, Pakistan Airways, Air Jordan, Air Djibouti and Iran Air. The company was also hired to train pilots and supply navigators to the newly formed Lufthansa (originally Luftag, formed in January 1953) during 1954–55.

In service to the American government, Transocean transported thousands of military personnel, civilian defence workers, engineers, civil servants and their families on contracts worldwide. A commercial service within the Trust Territory of the Pacific Islands, under the auspices of the US Department of the Interior and the United Nations, was operated by the company from 1951 until 1960. Tens of thousands of refugees were relocated via humanitarian aid programmes on flights operated by Transocean, and the company pioneered services to Mecca in *hajj* pilgrimage airlifts.

Enemies in high places

Transocean was the first airline to initiate air-coach services between the mainland of the USA and Hawaii and, in 1956, began operation of limited scheduled services under its supplemental certificate. Nelson's airline purchased most of BOAC's fleet of Boeing 377 Stratocruisers in the late 1950s when the British airline upgraded to Bristol Britannia turboprops and de Havilland Comet 4 jets, and flew the double-deck piston-engined aircraft on its restricted scheduled network stretching from New York to Okinawa, via the continental USA, Honolulu, Wake and Guam. Pan American World Airways and United Air Lines both fought this vigorously, using their influence at the CAB to keep Transocean's service to Hawaii in check.

Despite all of the success, Transocean suffered from the same problem affecting the other supplementals — a lack of outside investment from financiers, who were afraid that the airline's certificate could be revoked by the CAB at any time. In 1958 Nelson accepted funding from the Atlas Corporation, the same company that held a controlling interest in certificated carrier Northeast Airlines. Atlas's influence led to the dismemberment of the Transocean empire, which included maintenance operations and related support companies, leaving the airline a shell of its former self. The carrier hurtled toward bankruptcy and dissolution, which became a reality in 1960.

During the course of its existence Transocean operated a total of 146 aircraft, including 16 Curtiss C-46s, 68 Douglas DC-4s (C-54s), nine DC-3s, one DC-6B, 13 Martin 2-0-2s, eight Boeing 377 Stratocruisers, three Lockheed L-749A Constellations and two L-1049H Super Constellations. At the time of its bankruptcy and liquidation, negotiations were under way for the acquisition of three Boeing 707s, two of which had originally been ordered by Cubana. Two books have been written on the history of Orvis Nelson and his airline — *Transocean: The Story of an Unusual Airline* by Richard Thruelsen (Holt & Co, New York, 1952) and *Folded Wings: A History of Transocean Air Lines* by Arue Szura (Pictorial Histories Publishing Co, Missoula, Montana, 1982). **DHS**



One of the eight Boeing 377 Stratocruisers operated by Transocean, N404Q (c/n 15978) originally served with BOAC as G-AKGL Cabot from April 1950. It went to Transocean in August 1958. It was later used in the manufacture of an Aero Spacelines Super Guppy.

AUTHORS COLLECTION



ABOVE Lockheed L-749A Constellation N101A (c/n 2518) of Standard Airways sports a pink lower fuselage, which was fitting for the company's "Pink Cloud" service between the USA's West Coast and Honolulu. This Connie was acquired by Standard during 1962 and saw brief service with the airline, moving on to South America in late 1963.

Blade looking back on the accident 50 years later, the aircraft fishtailed 100ft (30m) above the ground, fell back to earth, flipped tail-over-nose and was soon engulfed in flames on the edge of the main east-west runway; 22 of the 48 aboard perished, including 16 of the team's players. It was revealed that the pilot in command, who had made the decision to take off in fog, was flying with a revoked licence, but had been allowed to continue flying pending his appeal. The crew had been on duty for 26hr. The engine that failed had been improperly installed and the aircraft was carrying a load some 2,000lb (905kg) over its allowed maximum take-off weight.

Shortly after the crash, *Life* magazine published an article entitled *Campus Overwhelmed by a Team's Tragic Flight*. All of the bad publicity that once haunted the non-skeds now came back to roost. Arctic-Pacific's certificate was rescinded.

On September 10, 1961, DC-6B N90773, belonging to President Airlines, which had taken over the certificate of California Eastern Aviation, crashed after take-off from Shannon Airport in Ireland on a flight from Düsseldorf to Chicago via Shannon and Gander. All 83 aboard were killed.

Instead of making a turn to starboard after take-off as instructed, the crew banked port 90° and the aircraft fell into the River Shannon. In addition to possible mechanical failure, crew fatigue was indicated as a contributing factor.

Then on November 8 the same year, Imperial Airlines Lockheed L-069 Constellation N2737A, with 74 army recruits aboard, crashed while attempting an emergency landing at Richmond, Virginia. Both starboard engines on the Connie had suffered fuel starvation, followed by the No 1 engine (on the port side) faltering as the crew attempted a go-around. All 74 of the recruits perished. A scathing article in *Time* magazine the following month stated that it was a wonder that Imperial's Constellation had managed to get off the ground at all. The article revealed that the 29-year-old pilot-in-command had failed three flight tests previously in his career; the Connie's fuel was contaminated by rust sediment; a fuel-pump motor had been repaired using a brush cut down from a 1954 Mercury automobile engine; one pilot had asked the flight engineer to open an emergency fuel valve but the other pilot told him not to. The airline's "incredibly slipshod methods

Founded by Kirk Kerkorian as Los Angeles Air Service, Trans International Airlines (TIA) was acquired by the San Francisco-based Transamerica Corporation in 1968 and renamed Transamerica Airlines in 1979. Here TIA L-1049H Super Constellation N6925C (c/n 4853) is seen at rest between flights at Baltimore during the summer of 1965.

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ABOVE Wearing a somewhat spartan colour scheme, Curtiss C-46 N1698M (c/n 22576) of Southern Air Transport is seen here in the late 1950s at Coolidge International Airport on the island of Antigua in the West Indies. This non-sked went on to become famous as a not-so-clandestine tool of the USA's Central Intelligence Agency (CIA).

of maintenance" were exposed when the Federal Aviation Agency's Miami inspector stated that half of his time was taken up dealing with Imperial's maintenance discrepancies.

After an impressive period of safe operations in the late 1950s, the supplemental airlines were once again faced with the problem of a few rotten apples among the healthy fruit. Another *Time* article stated that it was "statistically . . . 30 times more dangerous to fly on a non-sked as on a scheduled airline".

The next "shakeout"

Congress delivered its decision on the non-sked situation, issued as Public Law 87-528, on July 10, 1962. Once again, the supplementals would have to apply for a new licence. They had exactly one month to do so. Two companies missed the filing deadline — Transocean and Imperial, the former by less than 24hr — both losing their chance for recertification. In addition, eight other applicants were denied certificates. This time only 15 companies made the cut. A 16th, Argonaut Airways, requested and was granted a certificate for a brief period to fulfil contracts and wind up affairs.

There would now be strict oversight of every aspect of each company's business. As the CAB stated: "Public Law 87-528 clearly indicates the concern of Congress over operations by unfit supplemental air carriers, and its desire to restrict operations in the supplemental field to only those carriers clearly establishing, among other qualifications, [the] financial stability and fitness to be entrusted with interim authority". The supplementals selected to receive certification would have to be fully covered with liability insurance and their financial health would be scrupulously examined by the CAB.

The non-skeds would have to operate strictly as charter outfits, earning their livings from civilian

The CAB's final 15

THE LIST BELOW contains the 15 companies issued with interim certificates as supplemental air carriers by the CAB in 1962, as a result of Public Law 87-528, enacted by the House of Representatives of the US Congress.

AAXICO AIRLINES
AMERICAN FLYERS AIRLINE CORPORATION
CAPITOL AIRWAYS
JOHNSON FLYING SERVICE
MODERN AIR TRANSPORT
OVERSEAS NATIONAL AIRWAYS
PURDUE AERONAUTICS CORPORATION
SATURN AIRWAYS
SOUTHERN AIR TRANSPORT
STANDARD AIRWAYS
TRANS INTERNATIONAL AIRLINES
UNITED STATES OVERSEAS AIRLINES
VANCE ROBERTS (VANCE INTERNATIONAL AIRWAYS)
WORLD AIRWAYS
ZANTOP AIR TRANSPORT

A temporary 16th Certificate was also issued to **ARGONAUT AIRWAYS**

Source: CAB reports, Vol 37, Oct 1962–Feb 1963

and military contracts. As for the ten flights per month permitted for scheduled individually-ticketed flights between any two points, supplementals that were still offering such "route type" services had two years to make the transition fully to all-charter operations. Scheduled individually-ticketed flights would no longer be permitted after July 10, 1964.

Continuing its explanation of why the remaining supplementals were getting yet another lease of life, the CAB reported that "the Board is aware that for a substantial period of time the supplemental carriers and their predecessors



CHRIS KNOTT COLLECTION

ABOVE After a brush with bankruptcy in 1965, Overseas National Airways (ONA) went on to operate military and civilian charters with a fleet that included McDonnell Douglas DC-8s, DC-9s and DC-10s. This DC-8-63, N866F, named Sovereign, was acquired factory-fresh by ONA in April 1970. Sadly, ONA became a victim of deregulation.

have made a major contribution to the transportation needs of the Department of Defense under both routine and emergency conditions. It is clear that, in substantial part, their efforts in this regard were the basis for Board and Congressional interest in legislation which would assure them of legal operating status". In short, the CAB was telling the surviving non-skeds to be grateful that the military needed them to transport its troops, their families and its materiel.

In what would become fodder for conspiracy theorists, starting in 1962, MATS contracts were awarded primarily to a group of supplemental carriers represented by a man named Coates Lear, a partner in the Washington DC-based law firm Zuckert, Scoutt & Rassenberger. The Zuckert in the practice's name was Eugene M. Zuckert, who had recently been appointed Secretary of the Air Force. There was more than a hint that the military contracts were being awarded to a select group of "good old boys", or cronies.

Lear was the president of a newly-formed organisation, the National Air Carrier Association (NACA), which served as an agent for its seven members: American Flyers Airline Corp; Capitol

Airways; Modern Air Transport; Overseas National Airways; Saturn Airways; Southern Air Transport and World Airways. The organisation booked civilian charter groups aboard the member airlines' aircraft when the latter were not tied up with military charters.

The possibility of receiving a military contract was becoming increasingly remote for many of the supplemental carriers who were not "on the inside". Ralph Cox, President of United States Overseas Airlines (USOA), later claimed that he approached Coates Lear, asking to be represented by him and requesting future MATS contracts. Lear allegedly replied to Cox that USOA was a fit company and had proven itself over the years as a professional military contractor deserving of a contract. But several days later, according to Cox, Lear came back and apologised, stating that "the rest of the boys don't want you. They don't want me to represent you. I cannot do it".

To make the story even more intriguing, Coates Lear was found dead in 1963, the result of a shotgun blast to the head, shortly before President John F. Kennedy was assassinated that November. Although the official verdict was that Lear had

Boeing 727-185C N12826 of American Flyers Airline (AFA) at John F. Kennedy Airport in New York, in 1968. A successful military and civilian charter operator, AFA is perhaps best-known as the airline that transported The Beatles around the USA for their concert tours during 1964-66.

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ABOVE Saturn Airways Lockheed L100-30 "Super Hercules" N12ST. Along with ONA and AFA, Saturn was another of the lucky carriers to be represented by the National Air Carrier Association, of which Coates Lear was the president. Saturn absorbed Aaxico Airlines in 1965, before merging with Trans International Airlines in 1976.

committed suicide, there was speculation among conspiracy theorists that the deaths were linked.

Then the military spoke up; MATS issued a directive, effective from May 1, 1964, stating that a minimum of 30 per cent of any carrier's revenue must be derived from commercial sources in order to qualify for a military contract in fiscal year (FY) 1966. In other words, a non-sked could not rely solely on the military for its bread-and-butter. Then MATS dropped another bombshell: In the future, contract operators would be required to use jet-powered aircraft. It was time for the final weeding-out process to take place among the non-skeds.

MATS mistresses

As the deadline to end scheduled operations approached, only one of the supplementals was still offering this type of service. United States Overseas Airlines, which relied heavily on its scheduled services both domestically and across the Pacific, did not successfully make the transition to the required all-charter operation and was shut down by the CAB in late 1964.

Without MATS contracts, all but the handful of supplementals that still qualified under the military's rules were forced out of business. Ralph Cox referred to the surviving carriers as the "MATS mistresses". In the military's defence, America was becoming increasingly embroiled in the conflict in Vietnam and there was no place for an unreliable contractor among the airlines selected to transport troops. There had been too many instances of crashes caused by mechanical failure or incompetent airmanship, and too many accidents to which crew fatigue or improper loading had contributed. Now only a trusted few would get contracts. But some reliable, professional companies were thrown under the bus along with the "fly-by-nights". The era of the

scrappy non-skeds, fighting for their existence, was over.

Supplemental airlines continued to come and go during the remainder of the 1960s and into the 1970s, but not in the numbers that existed before 1964. As the 1970s progressed and the CAB became increasingly bogged down in its attempt to control America's airline network, some in government started to call for more freedom in airline operations and an end to the cumbersome bureaucracy represented by the CAB.

In 1976 the US Senate once again held hearings on the subject of irregular airlines. On the agenda was "The Decline of Supplemental Air Carriers in the United States". One final time, Orvis Nelson of Transocean Air Lines, Ralph Cox of USOA and various others got a chance to tell the tale of how their businesses had been treated by the CAB and by the military. All of this testimony was part of the process leading up to the Airline Deregulation Act of 1978.

After the Act was passed in October 1978, the category of supplemental airlines became superfluous. The CAB was slowly disbanded and all airlines gained more freedom to enter and leave markets and offer scheduled services. Many of the companies testing the waters of this newly-found freedom quickly realised that running an airline in a deregulated environment was a tough business. The legacy of the once-burgeoning group of airlines known as "non-skeds", "irregulars", "fly-by-nights" and "supplementals" remained alive until March 27, 2014, when the last of the remaining airlines that had started life as a non-sked, World Airways, ceased operations after filing for bankruptcy.



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ARMCHAIR AVIATION

We take a look at what's available for the aviation history enthusiast in the world of books and other literature, from hot-off-the-press publications to reissued classics

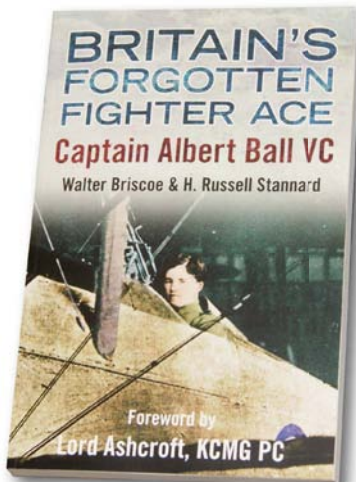
Britain's Forgotten Fighter Ace: Captain Albert Ball VC

By Walter Briscoe and H. Russell Stannard; Amberley Publishing, The Hill, Stroud, Glos GL5 4EP; 6in x 9in (155mm x 230mm); softback; 224 pages, illustrated; £14.99.
ISBN 978-1-44562-236-1

THIS BOOK WAS first published in 1918 under the title *Captain Ball VC of the Royal Flying Corps* and has now been republished to commemorate the centenary of the outbreak of World War One.

Albert Ball was born into a life of privilege, his father being the Lord Mayor of the City of Nottingham, and he enjoyed many of the advantages of his status, including attending public school. By the time he was 15 years of age, he was an excellent shot with the revolver, and had developed a keen interest in mechanics. At the age of 17, he acquired an interest in an engineering factory in Nottingham. His passion for mechanics was to stand him in good stead when he learned to fly, and later when he was engaged in aerial combat over France in the somewhat unreliable machines of the time. His marksmanship proved very useful when he flew fighter aircraft, and on one occasion he brought down an enemy machine by using his Service revolver to shoot an enemy pilot through the head in order to bring the combat to an end.

Led by a strong sense of duty, Ball signed on as an ordinary soldier as soon as war was declared in 1914, and was almost immediately promoted Sergeant. He also applied for a commission, and showed a further ability in turning round the canteen finances so that for the first time in many years a profit was made. In June 1915, he began to learn to fly in his own time, having to rise very early in the morning to fit in the lessons before his normal duties.



Once he had passed, he became ever more eager to put his new-found knowledge to use in France. His first posting was in flying observation missions, and he records in one letter that he found them "grand sport". This was a comment he made on many occasions, even when describing conflict with the enemy, who took war much more seriously, and were extremely puzzled by the apparently carefree attitude of their British opponents, including Ball, of whom it was said that in everything he did, he was "half schoolboy and half

soldier, but wholly loveable". His colleagues testified that he never grew up, and in a letter to his mother, he stated that "I went as a boy and I shall return as a boy".

Ball's letters to his family are full of his joy of flying, which was clearly lacking in any lust to kill. At no time did he glory in the death of an opponent. On one occasion, he pointedly wrote "I do get tired of always living to kill". He was a modest person, who did not seek publicity, and when the French started publicising his exploits after he had scored a number of kills when flying single-seaters, he found the attention difficult to cope with. When the English press took notice of his victories, his fame increased, culminating in his being granted the Freedom of the City of Nottingham. At the ceremony he was only able to speak two modest sentences about his experiences. When met by two young admirers who told him they were quite willing to die for their country, he showed his true feelings by responding wisely "You're no use! We want fellows who are anxious to live for their country, not to die..."

Those same letters give a revealing insight into the life of a fighter squadron on the Western Front, especially the camaraderie between the

pilots. Frequently Ball thanks his mother or sister for the gift of a cake, or similar delicacy, which had been shared out among and enjoyed by the members of the squadron. He was not someone to remain idle at any time, particularly hating periods of bad weather, which prevented flying. During such times, in addition to using his mechanical knowledge to improve his aircraft, he grew vegetables in a small garden. That produce was also shared with his fellow pilots. Ball was a very popular member of the squadron because of his care for his comrades, and when he was killed his loss was keenly felt by them all.

In correspondence with his family, Ball was quite open about his flying and combat experience, but took care to avoid alarming them by mentioning the possibility of death. As a flyer, he was fearless but not reckless, and tried to protect his family from the harsh realities of a pilot's life. Only once did he mention the possibility of death, and rapidly apologised to his father for any alarm he may have caused.

The letters from Ball to home were, naturally, written in the style and language of the time, being peppered with such words as "spiffing", "ripping" and "beastly". Such quaint language gives a true "period" flavour to the text, and fills out the character of its subject.

When Ball was killed, probably in a dogfight against vastly superior numbers, there was a general air of disbelief and many clung to the hope that he had crash-landed and been taken prisoner; but such hopes were to be dashed. By the time of his death he had registered 42 confirmed victories, and was considered by many to be invincible. By then, he had been awarded no fewer than three Distinguished Service Orders, and various foreign honours. He was awarded the ultimate accolade in the form of a posthumous Victoria Cross.

Upon Ball qualifying as a pilot, his instructor had graded him as "average", but as his score of victories mounted, it was clear that he had grown immensely in experience and stature as a pilot. German airmen would frequently flee from him when they recognised his aircraft, which sported a red spinner over the propeller boss. Even Manfred von Richthofen acknowledged that he was "by far the best English flying man".

At the time of his death, Ball was only 20 years old, having not achieved adulthood, which at that time was at the age of 21. In one sense, he did die as a boy, but he was clearly a brave young man, whose maturity and other attributes are well illustrated by this book, which itself profits by the use of many of his own words in correspondence, and by being a contemporary account of his life and death. This reprint is well timed and most welcome as a valued contribution to the history of air combat in World War One.

FRED CROSSKEY

F9F Panther Units of the Korean War

By Warren Thompson; Osprey Publishing, Midland House, West Way, Botley, Oxford OX2 0PH; 7¼in x 9¾in (186mm x 248mm); softback; 96 pages, illustrated; £13.99 + p&p. ISBN 978-1-78200-350-2

PERHAPS OVERSHADOWED by its more glamorous USAF compatriot, the North American F-86 Sabre, the Grumman F9F Panther did yeoman work in the three-year Korean War. It actually flew the first American strike missions from the *USS Valley Forge* (CV-45) following North Korea's invasion of South Korea on June 25, 1950, and fought throughout the bloody conflict from sea and land bases, delivering considerable amounts of ordnance on target in difficult weather conditions and against heavy Communist defenses.

There was nothing unique in Grumman's design, a businesslike, straight-winged, somewhat underpowered fighter which

nevertheless offered Grumman's signature ruggedness, as well as a heavy punch of four nose-mounted 20mm cannon and a variety of underwing ordnance. It also flew hazardous reconnaissance missions, skimming over targets often at the risk of facing flak sites as well as equally dangerous MiG-15s flown by Russian, Chinese and North Korean pilots. Serving with squadrons of both the US Navy and US Marine Corps, the Panther was a true Grumman workhorse.

This book, No 103 in the *Osprey Combat Aircraft* series, features a spread of excellent



colour and monochrome photographs, complemented by the usual folio of colour profiles by artist Jim Laurier.

The text and captions are jammed with accounts and facts of the Panther's three-year war over the Korean peninsula, highlighting pilot experiences and action-packed missions over inhospitable terrain. Even in the supposedly warm summer months, the ocean and the land presented a variety of problems to Panther drivers who had to find their targets or bale out. Many Navy and Marine aviators were lost or captured to face harsh months of severe treatment, a harbinger of what the next generation of American aircrewmembers would face 15 years later and several hundred miles to the south in Vietnam.

Whether detailing attacking enemy troop or truck convoys, or hassling with MiGs, the story is well told by an author who knows how to do it. Veteran author [and regular *TAH* contributor — *Ed.*] Warren Thompson has filled the void of major accounts of the F9F in typically fine style.

PETER B. MERSKY

Iron Man — Rudolf Berthold: Germany's Indomitable Fighter Ace of World War I

By Peter Kilduff; Grub Street, 4 Rainham Close, London SW11 6SS; 7in x 10in (178mm x 254mm); hardback; 192 pages; illustrated; £20. ISBN 978-1-90811-737-3

ALTHOUGH RUDOLF Berthold might be rather less familiar to many than other German First World War aces who persistently steal the limelight, his outstanding record places him in the front rank of combat pilots. Berthold fought throughout the conflict and survived, only to be murdered in a violent political confrontation in Berlin in 1937.



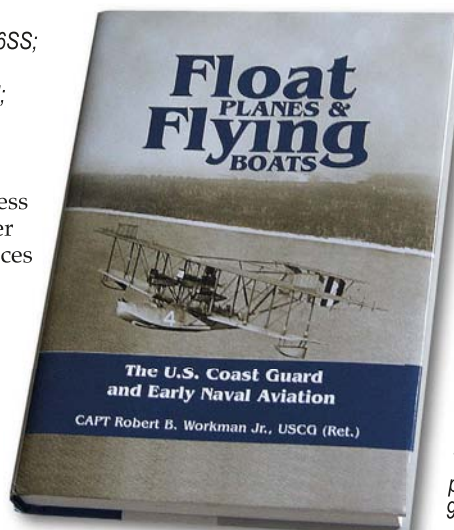
Only six weeks after the outbreak of the First World War Berthold's bravery and tenacity resulted in him becoming the first airman in the 2nd Army area to be awarded an Iron Cross. At the time he was an aircraft observer/commander; he gained his pilot's qualification on January 18, 1915, and was soon flying the Fokker Eindecker. He was the tenth recipient of the *Pour le Mérite*, and by the war's end, having progressed to the Albatros D III, Pfalz D III and then the Fokker D VII, he had 44 aerial combat victories to his credit, having

been shot down or forced to land on six occasions and surviving the resulting crashes every time. When his right arm was shattered by a bullet he taught himself to fly left-handed and returned to combat.

This very complete account of Berthold's life concentrates on his First World War experiences, and the author has gathered a good collection of relevant images that are well reproduced throughout the text. The text itself incorporates quotations from Berthold's personal war diary and from fellow pilots, as well as from source material from numerous archives and accounts, including German records of the period.

Useful appendices comprise a list of Berthold's victories and daily victory and casualty lists of *Jagdgeschwader* 2 units. Detailed endnotes, a good bibliography and an index round off the book. As a small bonus, colour side elevations of three of his aircraft, bearing his winged sword emblem, appear on the back of the dust jacket.

PHILIP JARRETT



Float Planes and Flying Boats: The US Coast Guard and Early Naval Aviation

By Capt Robert B. Workman Jr, USCG (Ret.); Naval Institute Press, available in the UK via www.amazon.co.uk; 7in x 10in (178mm x 254mm); hardback; 352 pages, illustrated; £29.95. ISBN 978-1-61251-107-8

ALTHOUGH 2015 sees the centenary of the US Coast Guard (USCG) taking its first practical steps into the establishment of an air arm, the stalwart organisation has often appeared to have been somewhat overlooked. There have been very few major books on USCG aviation, with only Arthur Percy's *US Coast Guard Aircraft Since 1916* for Airlife (Naval Institute Press in the USA) in 1991 immediately coming to mind. As I have always noted, a book written by someone who was, himself, deeply involved with the aircraft or mission he writes about is usually — although not always — much better than a book by an outsider or “armchair historian”. This Naval Institute Press tome is a fine illustration of that equation.

Written by a Coast Guard Academy graduate and retired USCG captain aviator who keeps his mind, heart and memories alive by creating highly detailed models for museums, this medium-format book presents more than just the traditional history of a service and the aircraft and people who flew in that service. Rather, he seems to recreate the world in which they all flourished, interacting with the US Navy and Marine Corps, which were also trying to establish their own air arms.

Helped by a fine collection of photographs, illustrations and reproductions of letters and correspondence, Capt Workman tells the story of the USCG and its struggles and triumphs during the seminal years connecting World War One and the beginning of the Second World War. He devotes a lot of space to telling the story of the first transatlantic flight by Navy Curtiss NC flying-boats in May 1919, certainly one of the most important events in early naval aviation.

Coast Guard aviator No 1, Elmer F. Stone, played an important role as pilot and navigator of the NC-4, the first aircraft to fly the Atlantic. Details of Stone's life and career permeate the narrative, including his premature death and the internal fighting within the defence department regarding Coast Guard aviation and its people.

The author notes that while Stone made Commander, his friends and supporters expected him to achieve flag rank. He never did, however, and it took a dedicated

friend's superb efforts to expunge Stone's final record of various false, politically motivated notes and reports that coloured the intrepid pioneer's achievements. The book carries a list of useful appendices, including a detailed chronology of USCG aviation and technology inspired by the NC transatlantic flight.

PETER B. MERSKY

Haute Voltige: Histoire Mondiale de l'Acrobatie Aérienne 1909-1939

By Alain Pelletier; Éditions Techniques pour l'Automobile et l'Industrie, Antony Parc 2, 10 Place du Général-de-Gaulle, 92160 Antony, France; 11¼ x 10in (297 x 250mm); hard-back; 192 pages, illustrated; €48. ISBN 978-2-7268-9768-3

THIS FRENCH-LANGUAGE book (the main title means “acrobatics” or “high-wire act”) is a well-illustrated record and celebration of world aerobatics' first three decades which reflects the verve of its subject while providing plenty of solid information.

The first of its eight chapters covers the pre-World War One birth of the discipline, featuring early stars such as Adolphe Pégoud and Lincoln Beachey. Next comes the honing of aerobatics in Great War combat — with the invention of manoeuvres such as the Immelmann turn — followed by the barnstormers of the 1920s and the parallel rise of national and international competitive meetings.

Other chapters cover the emergence of German pilots from the restrictions of Versailles; other prominent pilots; and aerobatics in Russia and the USA respectively. Throughout the book the main narrative is interspersed with biographies and aircraft profiles, the latter accompanied by small but cleanly-executed three-views.

More than 350 photographs (some of them a bit sootily reproduced), plus appendices including data tables and a chronology, complete a very welcome addition to the library.

MICK OAKEY

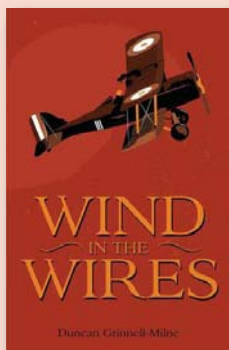


BOOKS IN BRIEF

A quick round-up of what else is currently available for the aviation history enthusiast

WIND IN THE WIRES
Duncan Grinnell-Milne
Grub Street; ISBN 978-1-90980-801-0; RRP £16

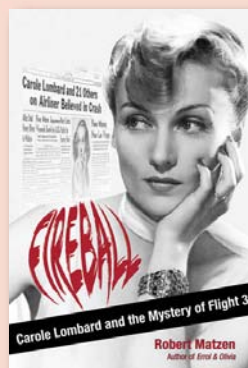
AN ATTRACTIVE REISSUE of Capt Duncan Grinnell-Milne's classic memoir of flying training and combat during World War One, first published in 1933. After learning to fly at Shoreham, the author was posted in 1915 to No 16 Sqn in France, where he was shot down and became a prisoner of war. Managing to escape, he returned to Blighty and flew S.E.5as over the front with No 56 Sqn. Along with Cecil Lewis's *Sagittarius Rising* and Arthur Gould Lee's *Open Cockpit* (the latter also available from Grub Street), this is a tome every Great War aviation enthusiast should have on the bookshelf.



FIREBALL: CAROLE LOMBARD AND THE MYSTERY OF FLIGHT 3
Robert Matzen

GoodKnight Books; ISBN 978-0-98850-251-2; RRP £17.22 (via Amazon UK)

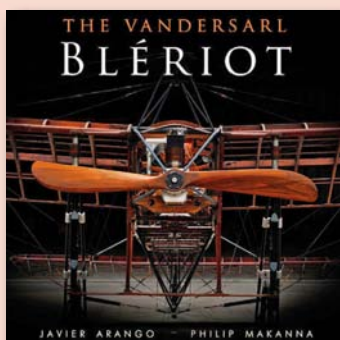
ROBERT MATZEN'S extraordinarily detailed investigation into the TWA DC-3 crash that killed Hollywood film star Carole Lombard in January 1942 — as covered in our inaugural issue — is not strictly a pure aviation book, covering as it does the life of the feisty actress and others aboard, but it is eminently readable and vastly entertaining. The photographs are well-reproduced and the whole package has quality at its heart — the investigation into the crash is forensic in its detail.



THE VANDERSARL BLÉRIOT
Javier Arango and Philip Makanna

www.ghosts.com; ISBN 0-916997-47-2; RRP US\$30 (+ US\$30 postage outside USA)

PHOTOGRAPHIC artist Philip Makanna — aka The Ghost — and WW1 aircraft restoration specialist Javier Arango, of the California-based Aeroplane Collection, join forces to pay tribute to Frank and Jules VanDersarl and the Blériot monoplane they built from scratch between 1909–11, and which, incredibly, Arango and his team have returned to the skies. As usual, this is a high-quality product from The Ghost, jam-packed with stunning photographs, both vintage and new.

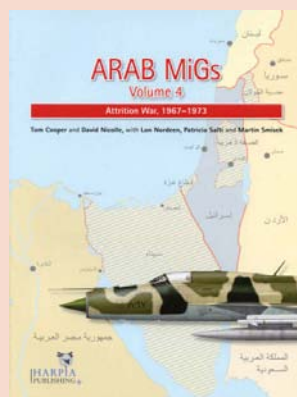


ARAB MiGs — Volume 4: Attrition War, 1967–1973

Tom Cooper and David Nicolle

Harpia Publishing; ISBN 978-0-98545-541-5; RRP €35.95 + p&p

THE FOURTH volume of this invaluable series on the use of air power in the conflict between the Arab nations and Israel during the Cold War covers the period between the Six-Day War of 1967 and 1973's Yom Kippur War. The latter is covered in detail in Volume 5, which is also available, and will be reviewed in depth in a forthcoming *TAH*.



CIVIL AVIATION IN NORTHERN IRELAND
Guy Warner and Ernie Cromie

Ulster Aviation Society; ISBN 978-1-78073-048-6; RRP £10.99 (UK)

ANOTHER well-researched and lovingly-put-together book on Northern Ireland's rich aviation heritage, this time on its civil activities, by the ever dependable Guy Warner and Ernie Cromie.



RAF LABUAN: BORNEO
David Bale

Book Guild Publishing; ISBN 978-1-90971-604-9; RRP £8.99

LABUAN ISLAND, off the north-west coast of mainland Borneo, has always played a key strategic role in the area, especially after the invading Japanese built the first airstrip there during World War Two. Liberated by the Australians in June 1945, the airfield at Labuan went on to become an important staging post for civil and military operations. The author, who served at RAF Labuan himself, has done a fine job of creating the definitive history of this little-covered — but historically significant — outpost.



Lost & Found

PHILIP JARRETT explores lesser-known corners of aviation history, discovering unknown images and rediscovering long-lost details of aircraft, people and events. Here he asks **TAH** readers for help with two intriguing postcards from British aviation's very early days

I RECENTLY ACQUIRED the two postcards seen here in close succession. The earliest was posted from Cosham in Hampshire on November 30, 1906, to one Lance Corporal W. Gallagher of the Royal Engineers in the Stanhope Lines at Aldershot. The naïve sketch depicts an “Aerocar” “Invented by Captain F. Haynes MM”, and is clearly based upon a triple Hargrave boxkite-type of structure with a loose sort of parachute device above and a car for the “aeronaut” and engine below. The engine drives a two-bladed pusher propeller, in front of which there is a rudder with a handle to operate it.

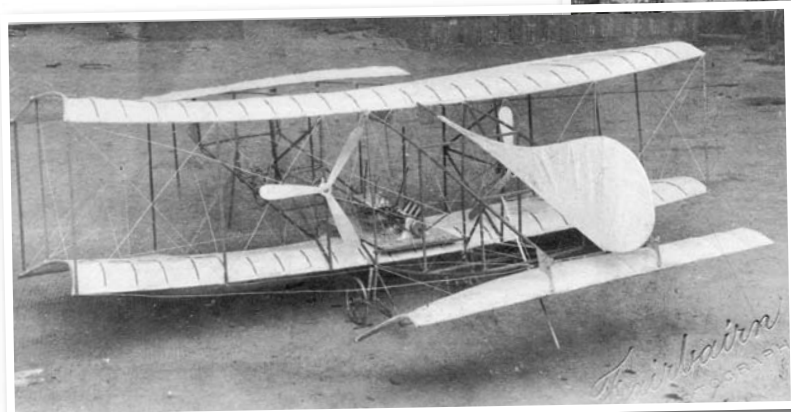
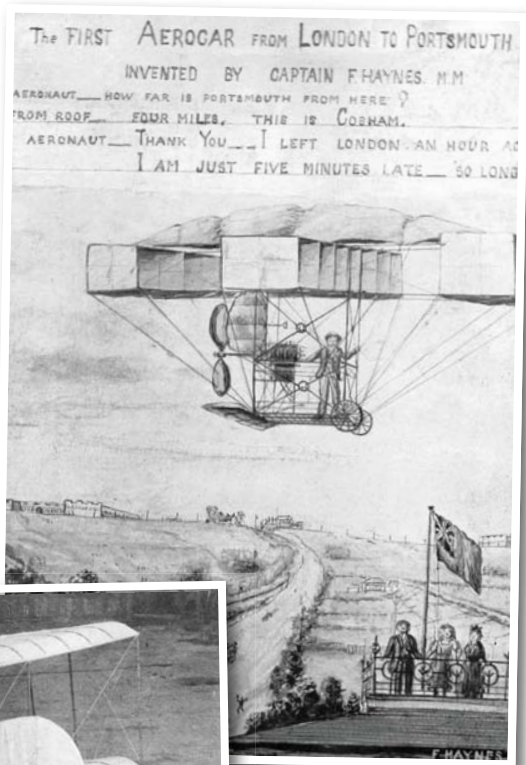
An elevator is attached to the rear of the car floor and twin wheels are affixed at the front. The contraption is said to be “the first Aerocar from London to Portsmouth”, and the aeronaut is asking the people on a roof beneath: “How far is it to Portsmouth from here?”, to which they reply: “Four miles. This is Cosham”. The aeronaut says: “Thank you! I left London an hour ago. I am just five minutes late – so long!”

A search for Captain Haynes has so far yielded nothing, and he does not appear to have patented his flying machine, so I know no more at present. Was it a serious project, or just an amusing subject for a comic postcard?

The second postcard depicts a large model aeroplane that I would date at about 1909-10. The photograph bears the imprint of a professional photographer named Fairbairn, and

the dealer from whom I bought it said the name was common in north-east England.

It seems to show a crude non-flying model of a Cody-type biplane with twin pusher propellers driven by belt drives from a six-cylinder vee engine, horizontal surfaces fore and aft, and a large and distinctive “droplet-shaped” fin. The wings have excessively deeply arched aerofoil sections. Was this a model of a proposed full-size machine, and who built it?



ABOVE Captain Haynes's boxkite Aerocar, as depicted on a recently-acquired 1906 postcard. **LEFT** The anonymous model aeroplane on another addition to the postcard collection; who was its creator?

ALIAS THUNDERBIRD



6

MELVYN HISCOCK celebrates the 50th anniversary of Gerry and Sylvia Anderson's unforgettable *Thunderbirds* television show with the story of one of the lesser-known machines in International Rescue's inventory, and how former ATA pilot Joan Hughes ended up having her collar felt during the filming of the second *Thunderbirds* movie

OPERATED FROM White Waltham airfield in Berkshire, de Havilland D.H.82A Tiger Moth G-ANFM is a frequent visitor to local airfields. If I am operating the radio at Popham, near Winchester in Hampshire, when "Foxtrot Mike" comes in, I can never bring myself to use its registration; instead I allocate it a unique callsign. The reason? I was born in the late 1950s and grew up watching television in the 1960s. For kids of that age there was a programme that caught our imagination and led to a couple of feature films. This particular Tiger Moth is not only a film star — as a number of other preserved aeroplanes are — this Tiger Moth is a Thunderbird!

FAST-FORWARD TO 2068 ...

Making its debut in 1965, *Thunderbirds* was a science-fiction TV series produced by Gerry and Sylvia Anderson which used Supermarionation — marionettes equipped with electronic gadgetry — instead of actors, a style that had previously been used in the TV shows *Supercar* (1961), *Fireball XL5* (1962) and *Stingray* (1964). The common theme running through the shows was plenty of action, great special effects and enough explosions to keep ten-year-old kids mesmerised for hours. The special effects were the result of pioneering work by Derek Meddings and his team, whose work was so advanced that many of the techniques they discovered were adopted by Hollywood and used in several major blockbusters, not least of which were the *Star Wars* films.

The success of the *Thunderbirds* TV series, one of the highest-budget television shows of its time and one of the first children's series to be allocated a 1hr slot in the schedules, made it clear that a feature film would be financially viable. The first of these, *Thunderbirds Are Go*, was released in December 1966. A sequel, *Thunderbird 6*, followed it in July 1968. The plot, set 100 years in the future, was typically *Thunderbirds*.

International Rescue is a secret organisation run by multi-millionaire philanthropist Jeff Tracy, a former air force colonel and lunar astronaut, and his five sons, all named after members of the Mercury Seven, the first seven astronauts selected by NASA in 1959. The organisation, committed to saving human life when conventional techniques have



THE CLERK ARK

newspaper comment on Parish Council's report that free parking for public car park at Rural Council's round Car park should be for their clerk and drew a reply from Councillor A. P. W. Monday.

the council was not instructive criticism, he mentioned to the article.

A council themselves parking for their and the parish council train delegates powers council, he said.

CE PARKING

parking matters the ed on Monday to ask other parish councils sections for the Rural her resolution calling a free parking to be shopping centres in

region of Councillor ix, the council agreed to question should be in two months time, said by Councillor this that they should / council, chairman . F. W. Coker com- have we shall get a

nt Quadruple field Stamps

ARAGE

Quarter Sessions jury are taken to the pictures!

THE DAY 'LADY PENELOPE' FLEW UNDER THE MOTORWAY BRIDGE

Risborough and Human Rights Year

A COMMITTEE for Human Rights Year is to be formed in Princes Risborough, under the chairmanship of Dr. H. G. Edwards, chairman of the parish council. This was decided on Thursday last week when Mr. Gordon Evans, secretary of the United Kingdom Committee for Human Rights Year had addressed a meeting at the British Legion Hall, Princes Risborough at the invitation of the local branch of the United Nations Association.

Mr. Evans said that the declaration not only deals with equal rights for women and people of different race, colour or religion but also social and cultural rights. "People need freedom in individuals, to develop their personalities," he said. When asked what local people could do to promote the Declaration, Mr. Evans said that information had been circulated throughout schools in the United Kingdom.

SUGGESTION

He suggested that the local authority, in this case the parish council should form a committee and when this was agreed Dr. Edwards was asked to call a meeting. Mr. Evans said that the copy of the Declaration made a good war memorial because the creation of it must prevent wars. He suggested that a copy of it should be displayed at local council offices and town halls.

In thanking Mr. Evans, the Rev. E. P. Fox said that one of the things a local committee could help with was the large number of migrant children who on their completion of education in local schools would

TO MISS JOAN HUGHES, 32 years a pilot of light and other aircraft, flying a Tiger Moth biplane under the Bigmore Bridge on the M40 motorway at Stokenchurch, presented no difficulty or danger to herself, the aircraft or the bridge, she told Bucks Quarter Sessions on Tuesday.



MISS JOAN HUGHES

Miss Hughes was, however, taking the part "Lady Penelope", ATV serial star from the Thunderbirds series. And she was not supposed to fly under the bridge. Permission had been given by the Board of Trade for "Lady Penelope" to fly the Tiger Moth up the motorway, land on the road before the bridge, taxi under the bridge and take off again.

of low flying endangering an aircraft, endangering persons and endangering a structure by flying nearer than 500 feet from the highest point of the bridge.

Film production manager, Norman Foster of Cherrywood Gardens, Flackwell Heath, pleaded not guilty to three charges of aiding and abetting dangerous flying and one flying. Personal Plane Services, of Wycombe Air Park, pleaded not guilty, through its managing director, Mr. E. Bianchi, to three charges of being owners of the aircraft used in dangerous and low flying.

TEST RUNS

Mr. Ivor Griffiths, prosecuting, said three test runs were made on before 8 a.m. on Sunday, May 21, 1967. On these runs the biplane landed, taxied under the bridge and took off without difficulty. The weather forecast, which had been issued to Hughes, however, stated that the wind would freshen later in the day and would vary in strength between 10 and 15 k. and would be south to



SCHOOL

LEFT A piece in the March 22, 1968, edition of the Bucks Free Press, reporting the court case brought about by Joan Hughes flying Tiger Moth G-ANFM under a bridge on the M40 for the filming of Thunderbird 6 in May 1967. The report states that after a 2½-day hearing, the jury took a mere 40min to reach a verdict of not guilty on all 13 counts of the indictment.

BELOW Joan Hughes flies through the gap between the Bigmore Lane bridge and the roadway on the M40 in G-ANFM on May 21, 1967. She was supposed to land and taxi under the bridge, but as she explained to the court: "It was a little turbulent as I came in and I considered it was not advisable to land when I was 150-200yd from the bridge. I decided to fly rather than touch down. There was positively no danger".





ABOVE *Tiger Moth G-ANFM, probably at Booker, in its distinctive red and yellow Thunderbird 6 colours and with life-size dummies clinging to the wing struts and undercarriage structure. The aircraft, D.H.82A c/n 83604, was built in 1941 and served with the RAF as T5888, before being put on the civil register as G-ANFM in October 1953.*

proved ineffective, attend major emergencies across the world in their fleet of five vehicles designed by the bespectacled "Brains". These are beyond the technology of any single country and include a hypersonic variable-geometry-wing rocket aircraft (Thunderbird 1); a supersonic VTOL heavylift aircraft (Thunderbird 2); a vertically-launched reusable single-stage-to-orbit spacecraft (Thunderbird 3); a submarine (Thunderbird 4) and a space station in geostationary orbit (Thunderbird 5).

The Tracys' arch-enemy is "The Hood", who operates from a temple in the Malaysian jungle and wants to gain access to the organisation's secrets for his own evil ends. International Rescue, whose characters all had American accents in order to help sell the series in the USA, also had a glamorous female agent in London; Lady Penelope Creighton-Ward, an English socialite who operated with her safe-cracking former convict and butler Aloysius Parker.

In *Thunderbird 6* Brains designs a futuristic aircraft called Skyship One, an airship that will circumnavigate the world with pre-programmed stops. Inevitably, this is hijacked by The Hood in order to lure the Tracys into sending the Thunderbirds into action, enabling him to hijack

them too. Naturally, as the plot unfolds, several characters need to be rescued. The vehicle used for this is Lady Penelope's Tiger Moth, the only thing light enough to land on the airship. The newly-named Thunderbird 6 departs the stricken airship with several of the characters holding on to struts, undercarriage and wings, and flown by Lady Penelope.

For the filming, some work was completed with models, but it had been decided that a real Tiger Moth would be flown with the characters on the wings depicted by polystyrene models. The film unit for the flying sequences would be based at Booker airfield, near High Wycombe in Buckinghamshire, and the Tiger Moth would be flown by former Air Transport Auxiliary (ATA) pilot Joan Hughes MBE.

THE ESTIMABLE JOAN HUGHES

Joan had started flying at the age of 15. Her older brother had joined the Civil Air Guard, a 1938 government-sponsored scheme that subsidised training fees for members of flying clubs, in return for future military call-up commitments. As Joan explained in an interview with the author before her death, aged 75, in 1993, she was "a typically horrible little sister who

stamped and moaned" until she was allowed to go as well. She went on to gain her commercial licence and by the time she was 18 she was an accomplished flying instructor.

In 1940, aged 18, she was one of the first eight women pilots to be taken on by the ATA, with which she went on to fly numerous types, from Spitfire to Stirling, although the women were forbidden to pilot flying-boats. She explained: "I felt rather sorry for my brother, as he was a farmer, a reserved occupation, and was thus unable to join up, but I went on to fly all of these amazing machines".

When asked what her favourites were, she recalled that "the Spitfire was my favourite single; for the twins it was the Mosquito and for the heavies it was the Lancaster. But I also loved the Typhoon. It was like sitting on a rocket!" Her least favourite was the Fairey Barracuda: "If you didn't kill yourself getting in, you then had to fly it. You would hit the undercarriage lever and there were little windows under the wing; you would see the wheels waving around and then they would disappear. Just when you had forgotten them they would come back and tuck themselves in the wing".

Joan's introduction to film work came with the 20th Century Fox production *Those Magnificent Men in Their Flying Machines*, filmed at Booker during 1965. British post-war aviation legend Doug Bianchi had built the Santos-Dumont



ABOVE Joan Hughes (centre) discusses flying scenes for *Those Magnificent Men in Their Flying Machines* with Air Cdre Allen Wheeler (right), Shuttleworth trustee and technical advisor on the film.

BELOW Hughes at the controls of Doug Bianchi's Santos-Dumont Demoiselle reproduction during the making of *Those Magnificent Men* . . . in 1965.





Demoiselle reproduction for the film but found that he was too heavy to fly it. At eight stone (50kg) Joan was ideal and so she flew it at White Waltham where it was built. I asked her if it was a bit “flaky” and she replied: “Yes, but such fun!”

The Demoiselle was taken by road from White Waltham to Booker, where test flights were initially unsuccessful; Booker is 500ft (150m) higher than White Waltham and the aeroplane had exceeded its ceiling while on the back of the truck! The Demoiselle was re-engined with a more powerful VW engine and all was fine.

Joan was next asked to fly in another 20th Century Fox film, *The Blue Max*, in 1966, sometimes doubling for the male lead, George

Peppard. The latter was a keen pilot and had expressed a desire to do his own flying, but insurance issues prevented it. Joan later explained that she used to sneak him out in a Tiger Moth to give him a bit of flying time.

A BRUSH WITH THE LAW

For *Thunderbird 6* Joan was to fly the Tiger Moth as if Lady Penelope were a novice pilot, necessitating a certain amount of low-level and somewhat “creative” flying. The plan called for “Lady Penelope” to try and land on a motorway and fly beneath a bridge. An almost-completed section of the new M40, between Stokenchurch and Loudwater on the High Wycombe Bypass,

BELOW *Tiger Moth G-ANFM in its garish film livery but without the polystyrene passengers added for the bridge sequence. The red sections of the paint scheme are remnants of the Tiger Moth’s previous solid red scheme with a bare-metal engine cowling. For the film the top wing’s upper surface had a “sunburst”-type pattern applied.*

CENTURY 21/MGM/UA VIA MARCUS HEARN





ABOVE “Thunderbird 6” in the rather more tasteful colour scheme it wears today with the Reading Flying Group, which operates from White Waltham. The Tiger Moth is something of a film veteran, having also appeared in *The Little Prince* in 1974, *The Awakening of Emily* (1976), *Agatha* (1979) and, most recently, *The King’s Speech* in 2010.

would stand in for the fictitious “M104” motorway. The plan was to fly through the gap between the Bigmore Lane bridge and the roadway, but the Ministry of Transport and Police insisted that the mainwheels be in contact with the road while under the bridge. However, on the day of filming, a crosswind, combined with the drag of the dummies attached to the wings, made such a manoeuvre dangerous, and Joan flew through the bridge with 9ft (2.75m) clearance, contrary to the pre-arranged plan.

She later explained in our interview that she had been a little high on approach and so took appropriate action; “As you know, drag increases as the square of your speed, so I put the nose down. It felt like I just stopped in mid-air”. Joan was insistent that the intention had been to comply with the Ministry’s instructions, and she had only flown through as she was genuinely fearful of the consequences of touching down in the crosswind. She and production manager Norman Foster were arrested at the scene and prosecuted. Joan was charged on seven counts of “dangerous flying” and Foster on three of aiding and abetting. Both were summonsed to Aylesbury Crown Court.

Joan remarked that the courtroom time was not something she would wish to do again. One of the witnesses called was a policeman, who, it transpired, had failed to make aircrew during the war, the defence portraying him as jealous and vindictive as a result. Joan said that she felt rather sorry for him as the defence called his

character into question. Happily, both she and Foster were ultimately acquitted.

In the final cut of the film Joan’s flying scenes are intercut with sequences filmed on the film company’s backlot with a 1/4th-scale remotely-controlled model of the Tiger Moth.

“THUNDERBIRD 6, CLEARED FOR TAKE-OFF ...”

Some years after my interview with Joan, I chanced across a photograph of G-ANFM in a hangar, presumably at Booker, with the polystyrene dummies still in place. I acquired the photograph and filed it away in a drawer with a view to writing a feature on Joan’s flying work for *Thunderbird 6*. I never got around to it.

A few weeks ago I was operating the radio at Popham when John Coker, one of G-ANFM’s regular pilots called up. “Golf Alpha November Foxtrot Mike, radio check and taxi for return to White Waltham”. My answer with the relevant information was prefixed with the impromptu callsign “Thunderbird 6”. He called to say ready for departure and I gave him the wind direction. As he lined up on the runway John called “Thunderbirds are GO!” — perhaps not strictly correct radio procedure, but it did make me finally sit down and write that long-promised feature on a remarkable pilot’s hair-raising flying adventures for the silver-screen.



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AUTHOR'S PHOTOGRAPHS

OFF THE BEATEN TRACK


*Ever turned a corner to find something unexpected? The Aviation Historian's intrepid aeronautical explorer **PETER DAVISON** investigates the stories behind the oddities that turn up in the most unusual places*

WHILE ENJOYING THE hospitality of the Aero Club of East Africa at Wilson Airport, Nairobi, I was fortunate to tour the extensive ramp area at this busy hub. The field is dominated by light commuter types flying out to bush strips; mainly Cessna Caravans and various de Havilland Canada and Dornier types.

Imagine my surprise when I found this dusty Jodel D.9 suspended in the rafters. Further investigation reveals it to be the example handbuilt by Air Cdre Harold Probyn, registered in 1970 as 5Y-ALI.

Probyn emigrated to Kenya after the Second World War following a distinguished RAF career. He learned to fly in the Army in 1915 and earned a Distinguished Service Order over the trenches in 1917. Captain Probyn was promoted Wing Commander in 1937. He was Commandant of Cranwell during the Second World War, his most memorable quote being that "flying hasn't been as much fun since the invention of the parachute". When declared too old to fly in the UK at the age of 69, his response was to mutter "balderdash" and "poppycock".

After the move to Kenya he powered a Grunau

Baby glider with the VW engine from his wife's car, before building the Jodel D.9 to fly from his coffee farm. The D.9 Bébé was the first of the cranked-wing Jodel line conceived by Edouard Joly and Jean Delemontez in 1946. 

MAIN PICTURE *Extremely dusty and looking somewhat the worse for wear, Jodel D.9 Bébé c/n 527 hangs from the rafters of one of the hangars at Wilson Airport in Nairobi. Placed on the Kenyan civil register as 5Y-ALI in February 1970, it was flown regularly by Harold Probyn until around 1980.*



LEFT *The remarkable Harold Melsome Probyn in 1916, while serving with No 34 Sqn RFC on the Western Front. Probyn enjoyed a long and distinguished RAF career and in the 1930s acquired a Westland Widgeon which he and his wife flew all over Europe. He continued to fly after moving to Kenya, and died at the age of 100 in 1991.*



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High Hopes Professor Keith Hayward FRAeS takes an in-depth look at Britain's first post-war procurement crisis, exemplified by the troubled development of the Supermarine Swift

Politically Incorrect Early aviation specialist Nick Engler focuses on the flights — and fights — surrounding the controversial 1914 tests of the Langley Aerodrome

Taking Liberties Vladimir Kotelnikov tells the full story of the Soviet Union's appropriation of the USA's ubiquitous World War One-vintage Liberty engine



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